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UNITED STATES DEPARTMENT OF AGRICULTURE

DEPARTMENT BULLETIN No. 1355

Washington, D. C. ▼ November, 1925

FOOD HABITS OF THE VIREOS

A Family of Insectivorous Birds

By

EDWARD A. CHAPIN, formerly Assistant Biologist
Division of Food Habits Research
Bureau of Biological Survey

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FOOD HABITS OF THE VIREOS:

A Family of Insectivorous Birds

By Edward A. Chapin, formerly *Assistant Biologist, Division of Food Habits Research, Bureau of Biological Survey* [1]

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ECONOMIC RELATIONS

During the summer almost anywhere in the United States at least one species of vireo, and usually more than one, is to be found flitting about in the trees or shrubbery. In the eastern and central parts of the country the common species is the red-eyed vireo, which is considered the most abundant of all species of woodland birds. Others more or less common in the East are the white-eyed, warbling, and yellow-throated vireos, and in the far West there is another form of the warbling vireo that is abundant. The Philadelphia, the blue-headed, the Hutton, and the Bell vireos are found more or less locally. The black-whiskered vireo in the United States is found only in Florida, and the gray vireo is confined to the southwestern portion of the country where it is not at all common. One other species, the black-capped vireo (*Vireo atricapillus*), is very rare in the United States, and as no stomachs have reached the collection of the Biological Survey nothing can be said concerning its food habits.

Though in general the food items of all the vireos are very similar, their proportions vary in the diet of different species. For instance, the food of the red-eyed vireo is made up of about seven-eighths animal matter and one-eighth vegetable, whereas that of the yellow-throat contains vegetable matter only to the extent of one-fiftieth of the total, and that of the Bell vireos apparently to an even less extent. Caterpillars make up an eighth of the food of the Hutton and more than a third of the warbling vireos. Bugs are seldom eaten by the Philadelphia vireo and amount to but a tenth of the food, whereas

[1] Doctor Chapin has been transferred from the Biological Survey to the Zoological Division of the Bureau of Animal Industry since preparing this report.

the Hutton vireos obtain nearly half their food from this source. Stink-bugs form about a fifth of the food of both the blue-headed and the Hutton vireos. The red-eyed and Philadelphia vireos each make nearly a seventh part of their food of wasps and other hymenopterous insects, whereas the other vireos take barely half as much of this kind of food. Beetles form about an eighth of the total food of vireos, but in the case of the Philadelphia vireo they are a favored article of diet and amount to nearly a fourth. The useful ladybird beetles are notable in the diet of these birds and are especially important with the warbling and Hutton vireos, in each species amounting to about a twelfth of the food.

Most of the insects in the food of the vireos are either neutral or definitely injurious in their economic relations and may be placed on the credit side of the account of these birds. All vireos are especially fond of caterpillars, creatures which are almost exclusively injurious. Scale insects, which are uniformly destructive and numbered among the worst pests of horticulture, are a notable item of vireo food; and other tree pests, as round-headed and flat-headed borers, leaf beetles, click beetles, leaf hoppers, and tree hoppers are freely eaten. Weevils, a group of beetles whose very name has become almost a synonym for pest, also are preyed upon. Among the species taken are such well-known destructive forms as the clover-root, clover-leaf, cotton-boll, and nut weevils, the plum curculio, and bark beetles. Vireos must be given credit also for destroying ants and grasshoppers.

Useful insects taken by the vireos include some of the hymenopterans, predacious bugs, and beetles, among which are ladybird beetles (Coccinellidae). Vireos either find more ladybirds in the ordinary course of their feeding habits than do most other birds, or specialize upon them, an unfortunate habit economically, as these beetles are almost uniformly beneficial. Since vireos themselves devour many of the pests attacked by ladybirds, however, and since their capacity is so much greater, their depredations on ladybirds must be excused on the principle that the greater pest destroyer is more valuable than the lesser.

TABLE 1.—*Percentages of various items in the food of vireos*

Species	Number of stomachs	Animal food	Vegetable food	Scarabaeidae	Coccinellidae	Chrysomelidae	Elateridae, Buprestidae, Cerambycidae	Other Coleoptera	Rhynchophora
Black-whiskered vireo (*Vireosylva calidris*)	4	87.50	12.50	------	------	------	------	15.75	2.50
Red-eyed vireo (*Vireosylva olivacea*)	569	85.28	14.72	3.31	1.29	1.63	2.70	.78	1.13
Philadelphia vireo (*Vireosylva philadelphica*)	75	92.78	7.22	6.94	5.03	7.99	.96	.47	3.43
Warbling vireos (*Vireosylva gilva*, subspp.)	340	94.24	5.76	1.28	8.74	2.48	1.03	.55	1.45
Yellow-throated vireo (*Lanivireo flavifrons*)	160	98.26	1.74	1.84	.62	.82	3.57	1.82	4.23
Blue-headed vireos (*Lanivireo solitarius*, subspp.)	306	96.32	3.68	1.67	4.88	.96	3.39	.81	1.80
White-eyed vireos (*Vireo griseus*, subspp.)	221	88.24	11.76	.66	1.36	3.78	2.31	1.46	3.21
Hutton vireos (*Vireo huttoni*, subspp.)	70	98.23	1.77	.27	8.12	.25	.85	1.01	2.75
Bell vireos (*Vireo belli*, subspp.)	52	99.30	.70	------	2.19	3.98	1.69	1.31	6.09

TABLE 1.—*Percentages of various items in the food of vireos*—Continued

Species	Caterpillars	Other Lepidoptera	Pentatomidae	Other Hemiptera	Hymenoptera	Diptera	Other insects	Arachnida	Other animal matter
Black-whiskered vireo (*Vireosylva calidris*)	11.75	2.50	-------	2.75	3.00	-------	10.00	39.25	-------
Red-eyed vireo (*Vireosylva olivacea*)	32.43	2.76	7.03	8.33	10.79	4.46	4.59	4.05	Trace.
Philadelphia vireo (*Vireosylva philadelphica*)	24.13	2.17	1.67	8.79	13.96	11.76	1.14	4.34	-------
Warbling vireos (*Vireosylva gilva*, subspp.)	35.40	4.99	5.47	11.24	5.97	9.46	4.44	1.74	-------
Yellow-throated vireo (*Lanivireo flavifrons*)	23.10	19.35	15.50	7.62	5.07	7.36	4.92	2.38	0.06
Blue-headed vireos (*Lanivireo solitarius*, subspp.)	22.49	9.31	20.13	10.29	6.86	4.29	6.56	2.63	.25
White-eyed vireos (*Vireo griseus*, subspp.)	20.66	9.83	8.56	11.71	7.23	4.41	9.10	3.59	.37
Hutton vireos (*Vireo huttoni*, subspp.)	12.22	12.33	20.15	25.73	6.30	2.99	3.21	2.05	-------
Bell vireos (*Vireo belli*, subspp.)	15.89	4.74	9.34	25.09	6.44	.78	18.77	2.71	.28

In the fall, winter, and spring months, when insects are in hibernation, the vireos which remain in this country turn to plants for part of their food. The vegetable food varies according to the species, as shown in Table 1, from 0.7 per cent to 14.72 per cent of the total.[2] In no case did stomachs of any of the vireos contain a large proportion of cultivated fruit, and very few stomachs had any; so that, as fruit eaters the vireos are practically harmless. In all species almost the entire bulk of the animal food was made up of insects.

A list of all the items identified in the food of the vireos, showing the number of stomachs in which each item was found, is given in Tables 2 and 3, beginning on page 28.

BLACK-WHISKERED VIREO

Vireosylva calidris barbatula

The black-whiskered vireo is found in the United States only in the southern portions of Florida, where it is fairly common in the vicinity of Key West, and may be found as far north as Anclote Keys. Unfortunately, only four stomachs were available for examination, collected on Anclote Key, May 21 and 22, and at Seven Oaks, June 7.

Of the entire food, 87.5 per cent was of animal origin. By far the largest single item was spiders, 39.25 per cent of the whole; in one stomach were the remains of 10 individuals of one kind (*Tetragnatha*). Caterpillars and eggs of some moth or butterfly made up 14.25 per cent of the food. In one stomach were 10 small earwigs (Forficulidae), which represented about 10 per cent of the animal food. Miscellaneous beetles, including weevils from one stomach, made up 18.25 per cent, and the remaining 5.75 per cent was composed of wasps or bees and assassin bugs (Reduviidae).

The vegetable food, 12.5 per cent of the total, was composed of fruit of barberry (*Berberis*) and of ragweed (*Ambrosia*), found in three of the four stomachs.

[2] The figures available show no vegetable food for the gray vireo; but this is probably not trustworthy, because of the very small number of stomachs representing the fall months.

Although the number of stomachs examined was small, it is possible to check the results by comparison with those obtained by Wetmore, who analyzed the contents of 84 stomachs of the typical subspecies from Porto Rico. His findings [3] show that the bird is decidedly frugivorous, inasmuch as wild fruits or berries were detected in 80 of the 84 stomachs examined and amounted to 57.82 per cent. The remaining 42.18 per cent represented animal matter, of which all but 0.61 per cent was composed of insects or spiders, this small item being made up of two little tree toads (*Eleutherodactylus*). As in the case of the Florida birds, spiders made up one of the larger items, occurring in 30 stomachs and comprising 7.74 per cent of the bulk. Orthopteroid insects, consisting of grasshoppers (Locustidae) in three stomachs, walking sticks (Phasmidae) in two, praying mantids (Mantidae) in three, and miscellaneous orthopterans in nine, formed together 6.34 per cent. Cicadas, a lantern fly, and some small homopterans amounted to 8.29 per cent. Caterpillars were eaten by 21 birds and made a total of 9.7 per cent, the largest item of animal food. Weevils and leaf beetles, including the sugar-cane root borer and coffee-leaf weevil, occurred in more than a third of the stomachs, forming a total of 5.37 per cent. The remainder of the animal food was composed of ladybeetles (0.42 per cent), miscellaneous beetles (0.64 per cent), hymenopterans, including a wasp and an ant (2.03 per cent), flies (0.21 per cent), and earwigs, which were detected six times (0.83 per cent).

SUMMARY

It is evident from both the Florida and the Porto Rico accounts that there is little actual harm done by the black-whiskered vireo, and that it is entitled to encouragement. The spiders and some of the beetles eaten may be considered beneficial, but the caterpillars, weevils, and earwigs are certainly injurious. The bugs are about equally divided between injurious and beneficial forms, and the remaining items are either too small to be of importance or are neutral in their economic aspects.

RED-EYED VIREO

Vireosylva olivacea

The red-eyed vireo (fig. 1) is probably the most abundant of the members of its family. In the United States its range is restricted in general to the territory east of the Rocky Mountains; in Canada, it is practically transcontinental, with Great Slave Lake in the Mackenzie region approximately its northern limit. In migration the red-eye is reported as far south as Brazil.

During the summer months in almost any bit of woodland one may find this olive-colored bird going about its business of catching insects, or later selecting the berries of many of our native shrubs, and singing as if it were second nature to be cheerful. Even at noon, when most of the feathered tribe seek the cool shade, this little fellow continues its song and its search for food.

[3] Wetmore, Alexander, Birds of Porto Rico. U. S. Dept. Agr. Bul. No. 326, pp. 97–98, 1916.

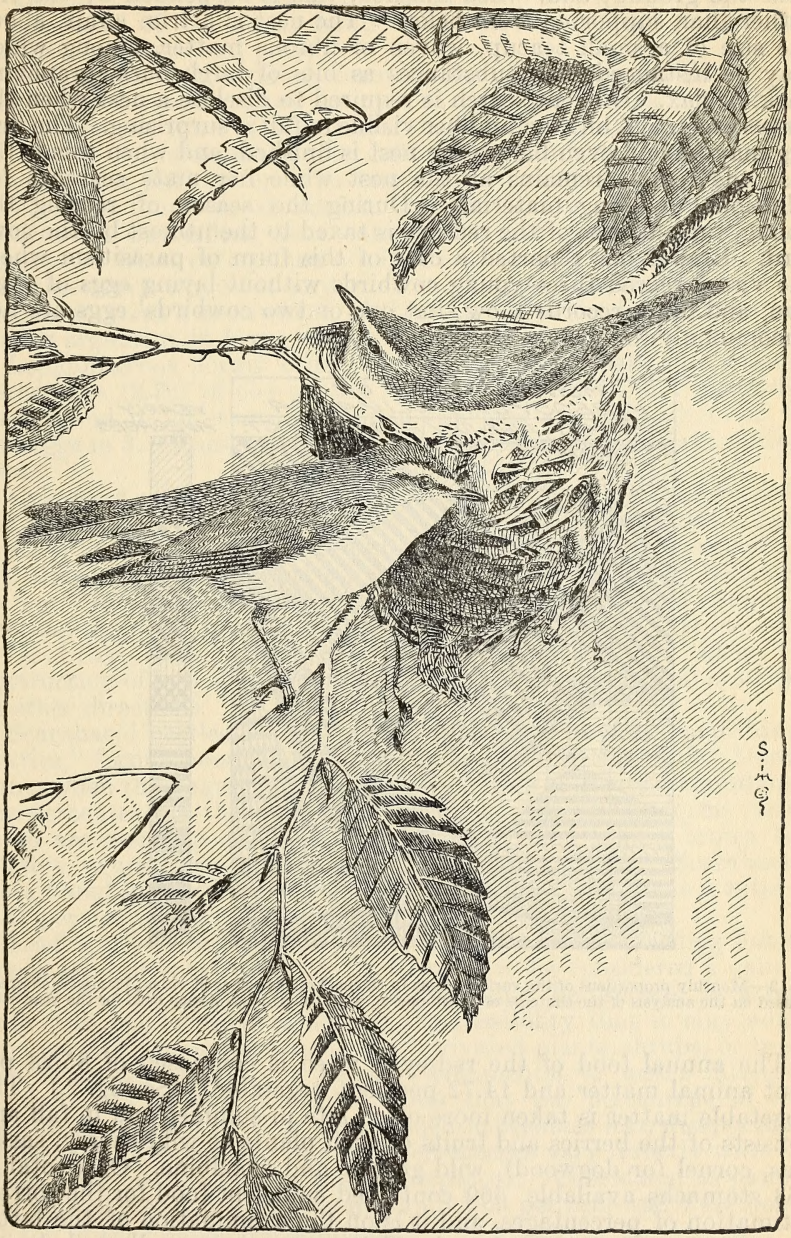

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FIG. 1.—Red-eyed vireos, male and female

When the mating season arrives, from the middle of May to the last of June, the nest is started in a convenient fork of a branch, often near the ground; and, when finished, this is suspended by the rim rather than supported from below. The nest is a trim affair, about the size of a small teacup, woven of fibrous matter, among which may be instanced such substances as bits of birch bark, grapevine bark, or flax. Diligent search is required to disclose a nest when the leaves are green, but the number visible in fall is surprising. The first egg may be laid even before the nest is finished, and when this is the case the female remains at the nest while her mate searches for additional building materials. During the season of rearing the young, the patience of the red-eye is taxed to the utmost by the cowbird. Brewer has reported a case of this form of parasitism where the vireos reared three young cowbirds without laying eggs of their own, and other records show that one or two cowbirds' eggs are not uncommonly found in a vireo nest.

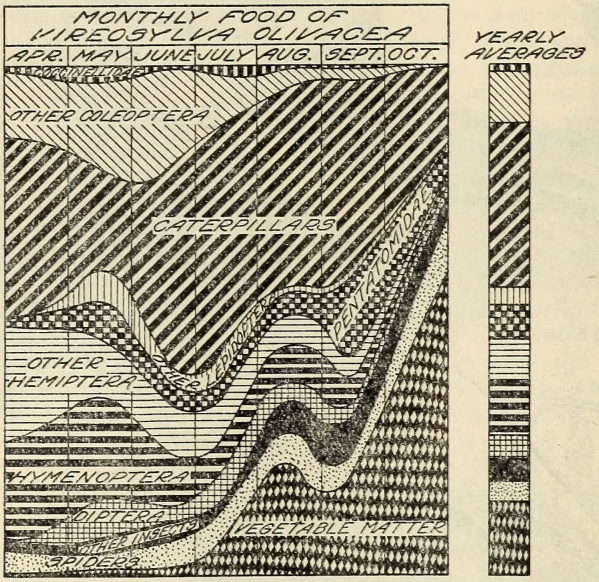

FIG. 2.—Monthly proportions of the various items in the food of the red-eyed vireo (*Vireosylva olivacea*), based on the analysis of the contents of 569 stomachs, with the average of each item for the year

The annual food of the red-eyed vireo is composed of 85.28 per cent animal matter and 14.72 per cent vegetable. (See fig. 2.) The vegetable matter is taken more often late in summer and in fall and consists of the berries and fruits of such plants as wild cherry, sassafras, cornel (or dogwood), wild grapes, and woodbine. Of a total of 653 stomachs available, 569 contained sufficient food for the correct estimation of percentages, and it is on the examination of the latter that the present report is based. This material was collected during the months April to October, inclusive, over the greater part of the range of the species in North America.

ANIMAL FOOD

Practically six-sevenths of the food consumed by the red-eye is of animal origin, and very nearly all of it is insects. The remainder is composed of the small snails that are found more or less frequently on leaves and grass.

Lepidoptera.—Caterpillars form by far the largest single item in the yearly sustenance, and amount to 32.43 per cent of the total, or more than one-third of the animal matter eaten. They were found in 371 of the stomachs, over half of the number examined. In general it is difficult or even impossible to identify the species of caterpillars found in stomachs, but the larvae of sphinx moths, swallowtail butterflies, tent caterpillars, and codling moths were detected. Most caterpillars are injurious to man's interests or have characteristics which at any time may cause them to become so. Hence, so great a destruction of these larvae as the figures show is a strong argument in favor of this vireo.

Lepidopterous forms other than caterpillars make up a small percentage (2.76) of the annual food. Adult moths and butterflies were found in 26 stomachs, pupae (cocoons and chrysalids) in 14, and eggs in 3. These may all be placed with caterpillars as injurious forms.

Coleoptera.—Beetles make up 10.84 per cent of the total food for the year, 1.29 per cent of which is composed of lady beetles. Lady beetles, or "ladybirds," as the members of the family Coccinellidae are often called, are, with a very few exceptions, decidedly beneficial to man's interests. Eighty-five of the stomachs examined contained coccinellids, some from three to eight individuals each. It can only be said that, considered in connection with all the food taken, the destruction of lady beetles is more than repaid by beneficial activities in other directions.

Scarabaeid beetles, otherwise known as "leaf chafers" and "dung beetles," form a small item in the yearly food of this bird. During June, when the larger leaf-infesting species are in greatest abundance, the percentage of this item rose to 11.88. Among the forms recognized are many species of the medium-sized and robust brown leaf chafers, which are capable of considerable damage. Scarabaeids were found in 75 of the 569 stomachs examined and made a total of 3.31 per cent of the food.

Leaf beetles (Chrysomelidae) are injurious in their feeding habits; hence the quantity taken by the vireo is to be considered a gain to man. Though a species of leaf beetle may be known to attack only wild plants, there is always the possibility that it may adapt itself at any time to life among the cultivated plants, shrubs, or trees, and with that adaptation become detrimental to man's interests. Examination of the stomachs shows that the percentage of leaf beetles rises to 4.4 in May, after which it becomes less, disappearing entirely in October. In fact, the percentages vary directly with the abundance of the item, as is to be expected. Considered as part of the annual diet, chrysomelids make up 1.63 per cent and were found in 136 of the stomachs examined.

Representatives of the three families Cerambycidae, Buprestidae, and Elateridae have been grouped for convenience. The larvae, or grubs, of all these beetles pass their lives either within wood or among the roots of plants and are very destructive to lumber and grain

each year. As with the leaf beetles, any check on these forms is to be welcomed, and a percentage as high as 2.7 is to be considered favorable to the bird. Nearly a third of the individual birds had taken this kind of food.

Under the heading of weevils are grouped all members of the suborder Rhynchophora, commonly known as curculios, billbugs, bark beetles, and the like. Weevils or their remains were detected in 141 of the stomachs and formed 1.13 per cent of the yearly sustenance. This percentage is small, but the average size of individuals among the Rhynchophora also is small, much smaller than in the preceding groups, and it is probable that the number of individuals represented is very large. Little good can be said of weevils. While many species have not yet come into direct conflict with man, their pernicious habits have been demonstrated by those which have; and although the percentage of these beetles eaten by the red-eye is relatively small, their consumption must be considered a favorable economic tendency.

Other miscellaneous beetle material formed less than 1 per cent (0.78) of the red-eye's food. It would be difficult to determine the economic status of these beetles as a whole. Certain families, as the ground beetles (Carabidae) and rove beetles (Stapyhlinidae), are usually considered beneficial. The checkered beetles (Cleridae) are beneficial and are now believed to be one of the most efficient checks on boring beetles. On the other hand, the forms which may be called injurious are few; for instance, the deathwatch or drug-store beetles (Ptinidae) and meal worms (larvae of Tenebrionidae).

Hemiptera.—Each year approximately 7.03 per cent of the food eaten by a red-eyed vireo is composed of stink-bugs (Pentatomidae). This family of insects includes the well-known harlequin cabbage bug, and several other species injurious to man. In fall, when other bugs and wasps become scarce, the red-eye eats a considerable number of stink-bugs, the quantity taken in September forming 16.15 per cent of the total food, and during September and October they are third in the list. The number of birds selecting this form of diet also is large, a total of 158, or over a fourth of those examined.

The rest of the true bugs make up 8.33 per cent of the annual food, but the frequency of their appearance in the stomachs is exactly the reverse of that of the stink-bugs. In April the percentage is very high, 20.26, and from then on it diminishes steadily, until in October it is 0.29 per cent. Among the species identified from stomachs are squash bugs, cicadas, scale insects, leaf hoppers, and assassin bugs. Hemipterans appear attractive to this bird, and it was found that of the stomachs examined 250 contained the remains of at least one bug. The small bulk percentage of this item is due mainly to the fact that most of the plant-infesting bugs are of small size.

Hymenoptera.—Over half (321) of the stomachs contained the remains of some species of the order which includes the wasps, bees, ants, and most of the insect parasites. Of these forms, ants are the most injurious and were taken by 93 of the birds. The remainder of the group is for the most part beneficial, as in it are found innumerable minute parasitic forms which do much to prevent the earth from being overrun with insects. Fortunately, the majority are so small as to avoid the notice of birds. The wild bees, wasps, and arger ichneumon flies, which are of service in the pollination of

flowers, suffer most from the red-eye; but their number is so great that it is probable that no one species is much affected by the vireo. As only two instances were found of the eating of a honeybee by this bird, it is evident that this vireo is not destructive to these useful insects. As with most of the hemipterans, the greatest destruction of the hymenopterans by the bird is in spring, the percentage for April being 20.39. This figure is increased to 20.97 in May, and from then on to the close of the season it diminishes steadily to 3.18 in October. Hymenopterans, with 10.79 per cent, stand third in quantity in the annual food of this species.

Diptera.—Flies, although eaten more or less regularly, do not at any time form a large portion of the diet of the red-eye. Remains of these were found in 119 stomachs and amounted to 4.46 per cent of the total food. Crane flies and midges appear to be the kinds usually taken; this is undoubtedly because such forms are more abundant in the natural feeding haunts of the bird.

Other insects.—Grasshoppers, katydids, stone flies, tree crickets, and similar insects together make up 4.59 per cent of the food. Of 569 stomachs examined, 88 contained at least traces of these forms, the percentage steadily increasing toward fall. This increase may be attributed to the greater abundance of the grasshoppers and katydids at that season and also to the growing scarcity of the foods which formed substantial percentages in spring. There are both beneficial and injurious forms included in the miscellaneous category; but it is evident from the stomach analyses that the injurious forms, as grasshoppers, outnumber the beneficial forms—dragonflies, and other predacious amphibious insects—by more than two to one. One can hardly begrudge the vireo this small toll (about 2 per cent) collected while performing a good service.

Spiders.—Most spiders make their homes on bushes and in the branches of trees and there spread their filmy nets to catch whatever unwary insect may stumble into them. Thus both the red-eye and the spider are helping to check the increase of insects. But as the predatory activity of 10 or even 100 spiders is not comparable to that of one vireo, the bird is economically the more useful. That the remains of spiders were detected in 188 of the stomachs examined indicates that they are a favorite article of diet with this vireo. In August, when they are most abundant, spiders amount to nearly 6.5 per cent of the total food, but this figure is not maintained either in spring or fall, and the annual percentage is only 4.05.

Other animal food.—Apparently it is only curiosity which leads a red-eyed vireo to take animal food other than insects or spiders. Remains of snails, probably of a kind usually found on leaves and grass, were found in two stomachs collected in June, and as they form only 0.02 per cent of the food of that month they are entirely lost in the yearly averages.

VEGETABLE FOOD

During the first part of the year, when insect food is plentiful, the red-eyed vireo takes very little vegetable matter. From August on, however, the vegetable food increases rapidly, until in October the percentage of 49.41 is reached. Berries of all kinds find favor with this bird, from the sweet mulberry to the bitter barberry. Of the berries most used by man and eaten also by the red-eyed vireo may

be mentioned white mulberries, found in 3 stomachs; wild cherries, in 1; currants (probably wild), 1; blackberries, 9; elderberries, 10; blueberries, 1; and grapes (the wild chicken grape), in 2. Berries without even so much economic importance, that appear most often in the stomachs are those of spice bush, found 7 times; cornel of various species, 22 times; bay, 5; Virginia creeper, 11; and sassafras, 6 times. Thus the predominance in the food of the nonuseful fruits over the useful is great. The total vegetable matter, which also includes a few grass seeds and flower and leaf buds, amounts to approximately one-seventh (14.72 per cent) of the yearly food, and is second of the items in quantity.

SUMMARY

During the months April to October, inclusive, the food of the red-eyed vireo is made up of six-sevenths animal matter, practically all insects, and one-seventh vegetable, mostly fleshy fruits and berries. Not more than 5 per cent of the entire food can be considered of great economic value, while most of the remaining 95 per cent is of kinds decidedly injurious to man's best interests. It is, therefore, obvious that in usefulness the red-eyed vireo ranks high.

PHILADELPHIA VIREO

Vireosylva philadelphica

The Philadelphia vireo is rather uncommon in the United States over the greater part of its range, but may be found in considerable abundance at times in Canada. Somewhat smaller and more gray than the red-eyed vireo, it may be recognized by its small size and the yellow of the throat and breast. The breeding range is in general north of the United States, although there are records of breeding birds as far south as Indiana.

The collection of the Biological Survey contains 84 stomachs of this bird; only 75, however, taken in the months of May, June, and September, contained sufficient food for the proper estimation of percentages. (See fig. 3.) The food is largely animal in nature, there being but 7.22 per cent not of this character.

ANIMAL FOOD

Insects make up all but 4.34 per cent of the animal food consumed by the Philadelphia vireo in the summer months—this small percentage representing the spiders so frequently present in the food of insectivorous birds.

Lepidoptera.—The largest single item is the group consisting of caterpillars and adult moths and butterflies, which together make an average yearly percentage of 26.3, or more than a fourth of all the food consumed. Of this, only 2.17 per cent refers to adults, leaving a total of 24.13 per cent for the caterpillars. It appears that as the season advances caterpillars become more and more important in the food, for in May the percentage is only 15, while by September it has risen as high as 39.94, which, taken with 5.59 per cent of adults, makes a total of 45.53 per cent, or nearly half the entire food of the month.

Coleoptera.—A total for the year almost as great as that of caterpillars and their adult forms is found to be made up of beetles and

weevils, which form almost a fourth (24.82 per cent) of the total. The beneficial beetles eaten are almost all of the family Coccinellidae, or ladybirds, well-known as enemies of plant lice and scale insects. Thirteen species of ladybirds have been identified from stomachs of the Philadelphia vireo, and these make up a little more than a fifth of all the beetles consumed, or about 5 per cent of the total food. This large percentage, however, is more than offset by the remaining beetles most of which are species of distinctly injurious tendencies.

The leaf-eating beetles (Chrysomelidae) lead the list of families of injurious beetles, with a total of 7.99 per cent. During May the leaf eaters seem to be more abundant, as then they make up a total of nearly 11 per cent. This high percentage is not maintained throughout the year, however, and by September only 4.59 per cent of the food is of this description. Next in order of importance from the viewpoint of quantity consumed come the leaf chafers and dung beetles (Scarabaeidae). The true dung beetles should be considered

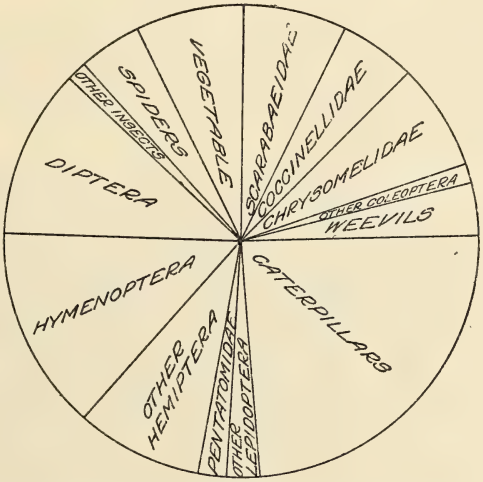

FIG. 3.—Yearly summary of the various items in the food of the Philadelphia vireo (*Vireosylva philadelphica*), based on the analysis of the contents of 75 stomachs

mildly beneficial, inasmuch as they carry beneath the surface quantities of fertilizing elements. As the very nature and mode of life of the vireo, however, prevents it from catching many of these, they have been included with their injurious cousins, the leaf chafers. Taken together, they represent a total of 6.94 per cent, all eaten before September. In June the percentage is very high (14.08), and it is almost all leaf chafers.

A third group of injurious beetles found with some frequency in the stomachs is the suborder Rhynchophora, or weevils, which make up 3.43 per cent of the food of the Philadelphia vireo. Although this proportion is not very great, it appears to be evenly distributed throughout the year. The wood-boring beetles, Buprestidae and Cerambycidae, and the plant-feeding Elateridae together make up a little less than 1 per cent of the total. Except in June, when these forms exceed 2 per cent, the item is insignificant. The rest of the beetles eaten, including beneficial, injurious, and neutral forms in

varying proportions, amount to only 0.47 per cent and may be disregarded for practical purposes.

Hymenoptera.—Approximately 14 per cent of the annual subsistence of the Philadelphia vireo is composed of wasps, bees, and related insects. Here are to be found some of the most beneficial of all insects, the parasitic ichneumon flies and the minute chalcids. On the other hand, the kinds of ants eaten are usually injurious, especially the large, black, carpenter ants (*Camponotus herculeanus*), and even if some of them do no direct damage they are indirectly injurious in fostering plant lice. At times the birds fill their stomachs with many individuals of the same species; for instance, one bird had eaten 20 individuals of a certain ant (*Aphaenogaster*); another, 10 sawflies (Tenthredinidae); and a third, 15 sawfly larvae. In its economic status the Philadelphia vireo, so far as hymenopterans are concerned, must be considered beneficial in that the injurious insects captured outnumber by far the beneficial forms.

Diptera.—In the 84 stomachs examined the remains of flies were detected in 36, or more than a third. In 19 of these the flies were of the midge family (Chironomidae), and in some, midges made up nearly the entire contents. Flies form 11.76 per cent of the food. This item includes both beneficial and injurious forms and may be listed as economically neutral.

Hemiptera.—True bugs make up 10.46 per cent of the annual food of this vireo, 1.67 per cent being composed of stink-bugs (Pentatomidae). These are large, flat insects, and the majority are injurious. One group, including the species of the genus *Podisus*, are, because of their predacious habits, reckoned among the beneficial forms. Fortunately, members of this genus are rarely found in the stomachs of the Philadelphia vireo, hence the stink-bugs in general may be placed on the credit side. Assassin bugs (Reduviidae), another group of beneficial bugs, are entirely lacking in these stomachs, so that on the whole the true bugs eaten are to the credit of the bird.

Other insects.—The remainder of the insect food of this bird, amounting to but 1.14 per cent, has little or no economic significance. It is made up of a few neuropteroid insects, together with fragments so comminuted that further determination was impossible.

Spiders.—It is not surprising that spiders, so common on the leaves and twigs of bushes and trees, should have been taken by 34 of these birds to the extent of 4.34 per cent of their food. Once the kind eaten proved to be a daddy longlegs or harvestman (Phalangidae), and 10 times the fragments were readily determined as of the family of jumping spiders (Attidae). In the other cases, however, it was impossible to decide the kind of spiders represented. Spiders are probably all beneficial in a small degree, but the eating of a few should not count heavily against an insectivorous bird.

VEGETABLE FOOD

Lack of stomach material of the Philadelphia vireo, representing early spring or late fall, makes it impossible to show exactly how the relation between animal and vegetable food varies with the season. As the new crop of wild fruits develops, however, the birds are attracted to it, and in September this item forms 18.71 per cent of the diet. Among fruits identified were dogwood berries, taken four times, while bayberries (*Myrica carolinensis*), wild rose hips (*Rosa*),

and wild grapes (Vitaceae) were identified in only one or two stomachs each. No cultivated fruits or seeds were found, and there is nothing in the list of vegetable items to discredit the bird in any way. Although 18.71 per cent of the September food was of vegetable origin, the seasonal average from the stomachs available amounts to but 7.22 per cent.

SUMMARY

Outstanding features of the food habits of the Philadelphia vireo are its moderate consumption of vegetable food and the comparatively high percentage of ladybirds. This last item appears to be the one blot on the escutcheon of all members of the family of vireos. The rarity of the Philadelphia vireo, however, insures that it will do little harm in reducing the numbers of ladybird beetles.

THE WARBLING VIREOS

Vireosylva gilva, subspp.

The warbling vireo in its two subspecies is one of the more common of the vireos over the entire United States. A total of 356 stomachs were available for examination from 29 States and the District of

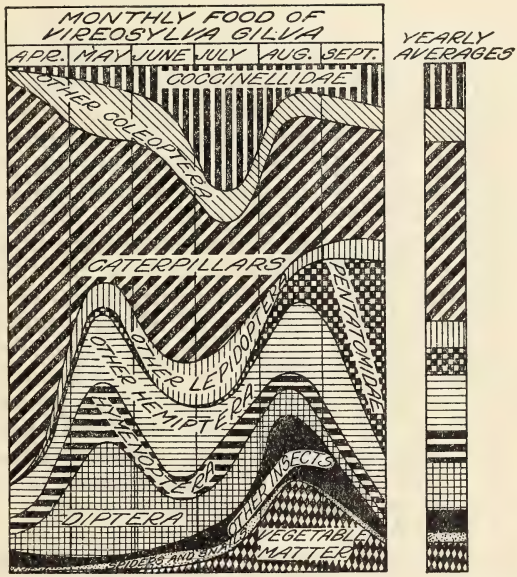

FIG. 4.—Monthly proportions of the various items in the food of the warbling vireos (*Vireosylva gilva*, subspp.), based on the analysis of the contents of 340 stomachs, with the average of each item for the year

Columbia and a few from southern Canada. Of these, 340 contained sufficient food to permit the estimation of percentages of the various items.

Between 5 and 6 per cent of the food consumed by the warbling vireos during the year is of vegetable origin. This is considerably less than half the proportion taken by the red-eyed vireo. The food of animal origin is discussed under its several classes. (See fig. 4.)

ANIMAL FOOD

Coleoptera.—Beetles make an annual total of 15.53 per cent, or nearly a sixth, of the food. Of these the ladybird beetles (Coccinellidae) are the most common. More than half of the coleopterans eaten are of this family, and more than one-twelfth of the food by bulk is composed of these valuable insects. During July about 26 per cent of all the animal food is ladybirds, a remarkable percentage, for coccinellids are far from being a fourth as plentiful as all other insects together. The remaining 6.79 per cent of beetles is composed almost entirely of injurious forms, as leaf eaters, wood-boring forms, and weevils.

Lepidoptera.—Caterpillars, usually injurious, make up the commendable percentage of 35.4—more than a third of the yearly food. This is undoubtedly the most important item in the dietary of the warbling vireo, especially in spring, when it amounts to 69.74 per cent. The percentage of this item fluctuates more or less during the season, reaching its lowest ebb, 22.75 per cent, in September. The other forms of butterflies and moths, amounting to 4.99 per cent, are included with the caterpillars and make a grand total for this type of food of 40.39 per cent.

Hemiptera.—The third class of animal food of the warbling vireo of sufficient importance to be considered separately is composed of the true bugs. These annually form 16.71 per cent of all the food, a little greater in quantity than the beetles. About a third of the bugs taken belong to the family of stink-bugs (Pentatomidae). These are mostly large, ill-smelling insects and are considered by some as protected from birds by their odor. In the present case, however, the odor is either pleasing to the birds or at least not repelling.

Other animal food.—The remainder of the food of animal origin amounts to a little more than a fifth of the total yearly food. The largest single item is made up of the different forms of flies (Diptera). During May, this item represents 22.63 per cent, or nearly a quarter of the food. From June on, however, there is a rapid decrease in the number eaten, so that by September, flies in the food constitute only 2.64 per cent. Considered for the whole year, a percentage of 9.46 is reached, a fair index to the value of these insects in the food of the warbling vireo. To this is to be added 5.97 per cent, representing the wasps, bees, and other hymenopterous insects consumed during the year. The incidence of hymenopterans is paralleled by that of dipterans, May being the month of greatest consumption, here equaling 12.02 per cent.

All other insects eaten together form the comparatively small percentage of 4.44. Only during August, when grasshoppers are abundant and a convenient form of food, does this item assume importance, at which time it forms 12.29 per cent of the monthly sustenance.

With the exception of a few snails, a mere trace, the rest of the animal food is composed of spiders, an almost insignificant item for the year, but amounting in June to 3.03 per cent.

VEGETABLE FOOD

The vegetable food of the warbling vireo is made up in great part of the smaller wild fruits, as cherry, sassafras, bayberries, and blackberries. During the early part of the year vegetable matter appears

to figure in the food only incidentally, but after the height of the insect season has passed the birds turn to the ripe fruits as a source of supply. Thus in April the vegetable matter formed but 0.12 per cent, but in August and September it ran as high as 18.69 and 9.33 per cent, respectively. Of the total food, this item makes up 5.76 per cent.

SUMMARY

The economic status of the warbling vireo is in some ways more distinctly unfavorable than that of the other species of this family of birds, especially in its consumption of ladybirds. In more than a third of the stomachs examined the remains of these beneficial beetles were found. Destruction of ladybirds is most evident in stomachs collected in California, where the members of this group of beetles are known to be unusually common. The species known as the California ladybird leads the list in number, appearing in 41 stomachs, as high as eight to a single stomach in a few instances. A second category of insects, which from predacious habits are to be considered beneficial to man, is made up of the species of stink-bugs of the genus *Podisus*, detected in 18 stomachs. Owing to their size, a few will completely fill the stomach of the bird, and thus the likelihood of extensive meals so far as numbers of the insects are concerned is not great.

On the other hand, the injurious insects taken by the warbling vireo make up the greater part of the food. Lepidopterous remains, including adult moths and butterflies, caterpillars, pupae, and eggs, were taken from about 77 per cent of those examined. This alone should atone for the bird's injurious proclivities along other lines. In addition to lepidopterans, the consumption of scale insects, which were found in 18 stomachs, and of bugs, omitting the forms of *Podisus* and a few others, swells the total of injurious kinds consumed. Little if any of the vegetable food taken was obviously cultivated, in most cases being from plants not used for their fruits. It seems reasonable, then, to class the bird as neither beneficial nor injurious.

It is probable that a warbling vireo in a citrus grove would be economically a liability, but in the woods and other places where the conservation of coccinellids is not of so great importance there is little to be considered objectionable in its habits.

YELLOW-THROATED VIREO

Lanivireo flavifrons

The yellow-throated vireo is the handsomest of the family and spends much of its time high up in the trees. This species is not uncommon in the eastern part of the United States, where it remains during the summer months to breed. It arrives in Florida and Texas about the last of March and by the first week in May many individuals have reached their breeding grounds. The return migration in fall commences early in September, and by October there are few birds of this species left in the United States.

One hundred and sixty stomachs of the yellow-throated vireo, collected during the months April to September, inclusive, were available for analysis, the most noticeable fact established by the

examination of which is the very small percentage of vegetable matter—only 1.74 per cent of the total. (See fig. 5.)

ANIMAL FOOD

The animal food of the yellow-throated vireo makes up 98.26 per cent of the total, and may be divided as follows: 95.82 per cent insects, 2.38 per cent spiders, and 0.06 per cent other animal matter.

Lepidoptera.—More than 42 per cent of the yearly food of the yellow-throat is made up of butterflies and moths in their different stages. As in the food of other species of this family of birds, caterpillars are the most important item (23.1 per cent). Almost all adult insects of this order found in the stomachs were moths, and together made up a total of 19.35 per cent. There appears to be no definite time of year when the birds prefer lepidopterous food, although in September a maximum of 36 per cent was reached for

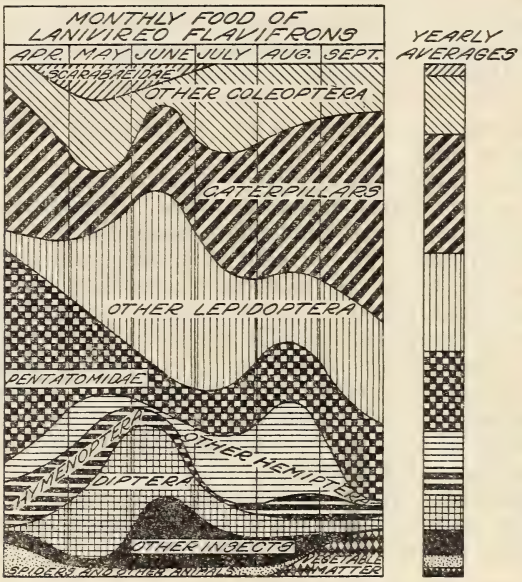

FIG. 5.—Monthly proportions of the various items in the food of the yellow-throated vireo (*Lanivireo flavifrons*), based on the analysis of the contents of 160 stomachs, with the average of each item for the year

caterpillars, and the same month showed an advance of 7 per cent over the previous month's total of 43.73 for all lepidopterans. Adults were consumed in greatest quantity in June, more than one-third (35.15 per cent) of all the food taken that month being of this character.

Hemiptera.—In quantity consumed, the bugs occupy second place in the list of food items of the yellow-throat. Two-thirds of those identified are referable to the family of stink-bugs (Pentatomidae), 15.5 per cent for the year. The remaining, 7.62 per cent, is composed of such forms as assassin bugs (Reduviidae), scale insects (Coccidae), and leaf hoppers (Membracidae). Owing to the great discrepancy

in size between the pentatomids and the smaller leaf-feeding bugs, the actual number of leaf hoppers and other small bugs is probably as great as that of the stink-bugs or even greater.

Coleoptera.—Beetles of all kinds, making up 12.9 per cent of the yearly food, stand third in the diet. Ladybird beetles, usually plentifully found in the stomachs of vireos, in this species amount to less than 1 per cent of the total. The rest of the insects may be classed as injurious, or potentially so. The weevils, or snoutbeetles, make 4.23 per cent, or about one-third of all the coleopterans eaten. The wood-boring forms belonging to the families Buprestidae and Cerambycidae and the plant-feeding Elateridae, together form more than one-fourth of the beetle food, or 3.57 per cent. Dung beetles and leaf chafers (Scarabaeidae) amount to 1.84 per cent, whereas leaf beetles (Chrysomelidae) and ladybird beetles (Coccinellidae) make, respectively, 0.82 and 0.62 per cent of the yearly food. Fragments of beetles that could not be associated with any of the above-mentioned families together make up 1.82 per cent of the whole.

Diptera.—Two-winged, or true, flies, make up 7.36 per cent of the yearly subsistence, of which the major part is consumed in May and June. More than one-fourth of the stomachs of the yellow-throat examined contained remains of flies, although in most cases the insects were not in condition to permit more specific identification. Midges (Chironomidae) and horseflies (*Tabanus*) were among the dipterans eaten.

Hymenoptera.—No honeybees were identified in the 160 stomachs of the yellow-throated viero examined, but other bees, as *Andrena* or *Halictus*, were found. Sawflies and ichneumon flies also were determined. Other hymenopterans were detected in lesser quantity, and together the insects of this order made up 5.07 per cent of the annual food.

Other insects.—The rest of the insect food amounts to 4.92 per cent, about equivalent to the bulk hymenopterans taken. Under this head are gathered all records of grasshoppers, crickets, locusts, and dragon flies and other water-inhabiting forms. In the food of the yellow-throated vireo this group is not of very great importance economically.

Other animal food.—Spiders, with the few snails the bird happened on, made up 2.38 per cent of the food. Snails were taken during April only and then only to the extent of 0.36 per cent, which, translated into a yearly percentage, makes the insignificant total of 0.06. Among the spiders eaten, the Attidae, or jumping spiders, were the most common. Species of *Phidippus* were determined four times, and fragments referable to family only were found in six other stomachs. The tetragnathids, which infest marshy localities, were identified twice, and once a minute pseudoscorpion of the genus *Chthonius* was detected. In general, the spiders eaten are only slightly beneficial.

VEGETABLE FOOD

The yellow-throated vireo eats comparatively little vegetable food, practically none during April and May, none during June and July, less than 2 per cent in August, and less than 9 per cent in September. The average for the year is only 1.74 per cent. Among the items specifically determined were sassafras berries and seeds of wild grapes. No cultivated fruit of any kind was found.

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SUMMARY

There can be no reasonable doubt that with an annual consumption of 42.25 per cent of caterpillars and moths, the yellow-throated vireo is to be classed as a beneficial bird. Adding to this the 7.62 per cent representing bugs, most of which are injurious, and the 10.46 per cent of distinctly injurious beetles, the total of 60.53 per cent is a fair estimate of injurious insects in the bird's food. To offset this, only 0.62 per cent is made up of the benficial ladybird beetles. The rest of the food is neutral economically and may be passed with this mention. This is a record to commend the yellow-throated vireo, and one that is not closely approached by other birds of this family.

THE BLUE-HEADED VIREOS

Lanivireo solitarius, subspp.

The blue-headed vireos, or, as they are sometimes called, the solitary vireos, are of fair abundance over a wide range, including all of the United States, most of Canada, and parts of Mexico and Lower California. The material used in this study includes 306 well-filled stomachs, collected in all months except December. January and November are represented by but 8 and 9 stomachs, respectively, whereas the greatest number for any one month, 79, is for May. Twenty-three other stomachs, only partially filled, gave some additional data regarding food items.

The blue-heads eat about twice as much vegetable food as the yellow-throat (3.68 per cent), but otherwise the diet is similar in its constituent items. (See fig. 6.)

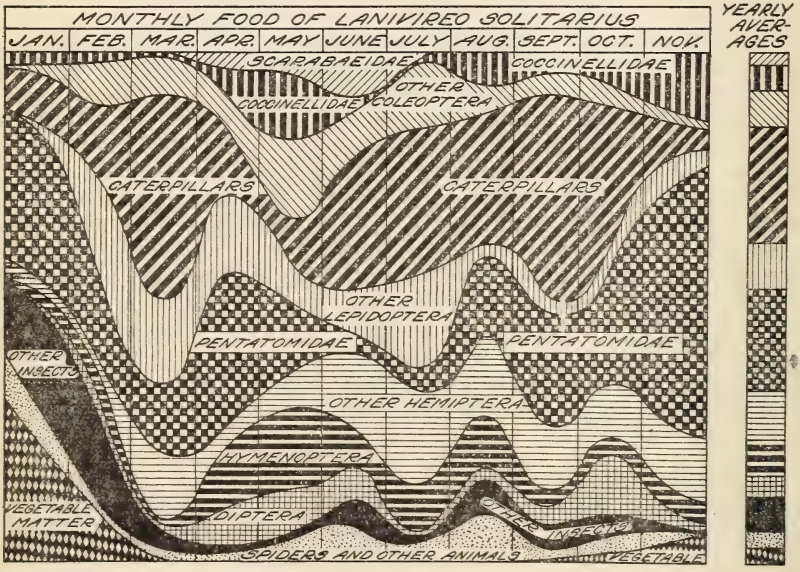

FIG. 6.—Monthly proportions of the various items in the food of the blue-headed vireos (*Lanivireo solitarius*, subspp.), based on the analysis of the contents of 306 stomachs, with the average of each item for the year

ANIMAL FOOD

Animal matter (96.32 per cent) in the food of birds of this species is, as usual in this family, composed almost entirely of insects, the few spiders eaten forming but 2.63 per cent and the snails 0.25 per cent, respectively, of the whole. This represents a slightly greater preference for each of these items than that displayed by the yellow-throat; but, even so, the quantity consumed is of academic rather than economic interest.

Lepidoptera.—The blue-headed vireos eat almost as many caterpillars during the year as does the yellow-throat, but their record for chrysalids and adults is not so favorable. The consumption of caterpillars increases rapidly during January, February, and March, when they constitute 41.56 per cent of the food of that season, and then drops to 10.47 per cent in May, and rises again to 40.39 per cent in September, after which it decreases rapidly with the approach of winter. This fluctuation is marked and, as it does not coincide with the known life cycle of the insects, may be attributed to fluctuating abundance of other more palatable or attractive foods. The average of the monthly percentages is found to be slightly below that for the yellow-throated vireo, being 22.49 per cent. On the other hand, the consumption of adult moths commenced in February with the relatively high percentage of 20.32 and steadily dwindled to 7.26 per cent in May. A rise, culminating in July with a percentage of 18.38, was immediately followed by a drop to 2.22 per cent in August. From August until the end of the season, the adult lepidopterans were taken in steadily increasing quantity, closing in November at 5.1. The yearly average of this item is 9.31 per cent, less than half that of the yellow-throat. Lepidopterans in all stages contribute 31.8 per cent of the entire annual subsistence.

Hemiptera.—True bugs form the second largest item of food of the blue-headed vireos. Owing to the predominance of stink-bugs (Pentatomidae) over all other kinds, this family has been tabulated separately. During the winter months hibernating pentatomids constitute one of the most important sources of food for the blue-headed vireos, as shown by the November and January percentages of 48.7 and 29.02, respectively. During February, March, April, and May there is considerable fluctuation in the quantities eaten, but all these months have relatively high percentages, the highest being 29.6 in April. June and July apparently offer more attractive food along other lines, as the consumption of stink-bugs then drops to 3.45 and 4.38 per cent, respectively. August shows a sudden increase to 16.4 per cent, and from then on the item assumes considerable importance. The yearly average (20.13 per cent) is considerably more than that of the yellow-throat.

The other bugs make up only about half as much of the total bulk of the food as do the pentatomids, but it is interesting to note that the ratio between these forms and the rest of the bugs is almost identical in both species of *Lanivireo*. There appears to be no rule followed by the blue-heads in their selection of bugs other than pentatomids for food, but in general they eat few before June and a great many in the later months of the year. March is an exceptional month, in that 12.91 per cent represents the miscellaneous bugs taken.

Coleoptera.—Considering the enormous numbers of beetles available, it is somewhat surprising that not more are eaten. The blueheads manage to seek out enough, however, to make up 13.51 per cent of their entire diet. Of this, the ladybird beetles make up 4.88 per cent, or more than a third. It is certain that there are not a third as many ladybird beetles as all other beetles combined; and thus it must be considered that the blue-headed vireos, like the warbling, either find these brilliantly colored forms in abundance in their environment or else make special search for them, a most undesirable habit economically. Roughly, a second third of the total bulk is composed of the metallic wood borers, the longicorns, and the click beetles. The remaining portion includes, among others, the weevils, which comprise 1.8 per cent of the food.

Hymenoptera.—With the exception of the month of March, miscellaneous hymenopterans were eaten in quantities varying from 1.75 per cent (in January) to 16.78 per cent (in May). Remains of no very important insect pests were found among the fragments from the stomachs, though several sawflies and ants were detected. The average for hymenopterans eaten during the year was 6.86 per cent.

Diptera.—Two-winged flies make up the comparatively small percentage of 4.29, or less than that of the single family of coccinellids (ladybird beetles), although flies are almost universally present. The flies of the woods are in general of little importance, excepting the bloodsucking forms; and as these are not often found in the stomachs, the economic importance of the dipterans in the food is slight.

Other insects.—Among the insects eaten which do not belong in the above classes are the stone flies, dragon flies, grasshoppers, crickets, and locusts (6.56 per cent for the year). In January this group is one of the most important, making 21.76 per cent of the food. February shows a slight decrease (18.38 per cent), and from then on the percentage varies from 1.24 in May to 7.5 in August. In general, this group is of no more importance economically than the dipterans.

Other animal food.—Spiders run very evenly in the food of birds of this species and are probably picked up whenever occasion offers. With the exception of February, when they amount to but 0.18 per cent, spiders are present in percentages varying from 1.51 to 5.55, the last figure representing August. The average of 2.63 per cent may be taken as a fair estimate of the quantity of this type of food eaten by the blue-headed vireos.

Snails are sometimes eaten, but so rarely that they are not to be considered an essential part of the diet (yearly average, 0.25 per cent).

VEGETABLE FOOD

During the winter months vegetable food is of considerable importance in the diet of this bird. In January nearly a quarter of the total was of vegetable origin (24.37 per cent) and in February less than a tenth (9.81 per cent). From March to and including August no trace of vegetable matter appeared in the food, but by November it formed 4.44 per cent. For the most part it was in the form of fleshy fruits, such as wild grape, dogwood, viburnum, and wax myrtle. No cultivated fruit was identified, and it is practically certain that none is eaten.

SUMMARY

The economic value of the blue-headed vireos rests largely upon their work in the consumption of caterpillars, moths, and hemipterans. Their destruction of ladybird beetles is to be regretted. The balance of favor, however, swings to the birds because of the overwhelming predominance of injurious forms in the food.

THE WHITE-EYED VIREOS

Vireo griseus, subspp.

The white-eyed vireos, in their subspecies, are locally common over the greater part of the eastern United States and Mexico. They are preeminently dwellers in damp, dense underbrush, one of their favored types of retreat being impenetrable growths of catbrier. In such places, during the proper season, one may hear the birds giving, in addition to their own song, impromptu imitations of other birds. The nest is similar to that constructed by the red-eyed vireo, but is placed lower, usually from 2 to 5 feet from the ground.

In the Biological Survey's collection of stomachs are 221 of this species suitable for tabulation. Eight others, nearly empty, afforded additional information concerning food items. These were collected over the entire range of the bird during the first 10 months of the year. Vegetable matter plays a much more important part in the economy of the species than in the case of either the yellow-throated or blue-headed vireos, but slightly less than in that of the red-eye, amounting to 11.76 per cent of the entire food. (See fig. 7.)

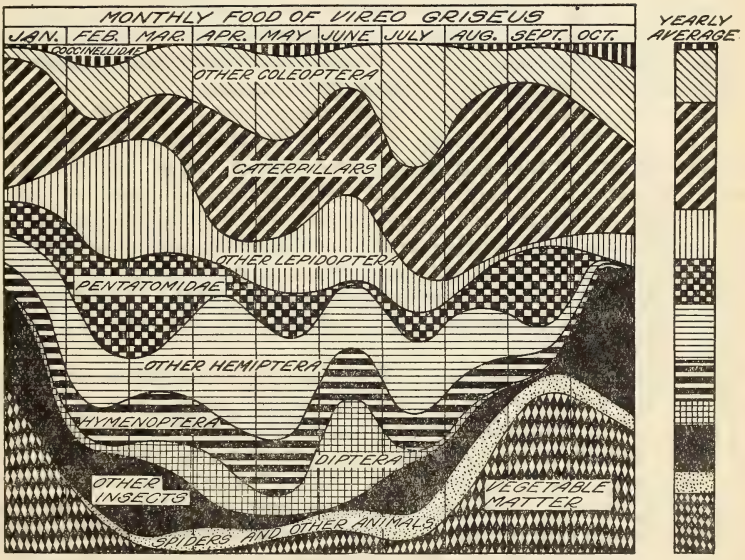

FIG. 7.—Monthly proportions of the various items in the food of the white-eyed vireos (*Vireo griseus*, subspp.), based on the analysis of the contents of 221 stomachs, with the average of each item for the year

ANIMAL FOOD

Nearly nine-tenths of all the food eaten by the white-eyed vireos is composed of insects, spiders, and other animal matter; of this all but 3.96 per cent is of insects.

Lepidoptera.—Moths and butterflies and their larvae (caterpillars) make up slightly less than one-third of the food of this species and form the most important item of the diet. Of this portion, 20.66 per cent is represented by caterpillars, and except for February and March a minimum of 18.7 per cent of the monthly food is of this item. The maximum is reached in August with a percentage of 33.12. The adult insects, on the other hand, are not nearly so plentiful in the stomachs, except during February and March, at the time when the caterpillars have become scarce. Taking adults and larvae together, the total does not fall below 26.33 per cent, and rises to 37.93 in June. The yearly average for the adult forms is 9.83 per cent, which with the caterpillars makes a total percentage of 30.49.

Hemiptera.—As with other species of this family of birds, the white-eyed vireos prey heavily upon stink-bugs (Pentatomidae) at nearly all times, although the toll taken in February and March is much greater than in summer. A second high point comes in September with 15.74 per cent. The yearly average is 8.56 per cent. The rest of the bugs make up 11.71 per cent of the yearly food. April is the time of maximum consumption, with a total of 24.18 per cent, and May follows with 19.25 per cent. Scale insects (Coccidae), which have not figured in quantity in the economy of the vireos previously discussed, are eaten by the white-eyes to the extent of 2.85 per cent. This is not a high percentage, yet, considering the small size of scales in general, it represents a great many individuals. In April, 12.78 per cent of the total food, or more than half of all the hemipterans eaten, was of the family Coccidae.

Coleoptera.—Beetles of all kinds make up 12.78 per cent of the total food. The leaf-eating forms (Chrysomelidae) and weevils (Rhynchophora) represent more than half of these, or 6.99 per cent. Except for the Philadelphia and Bell vireos, no other of the vireo family eats so many leaf beetles as this, while in percentage of weevils consumed the white-eyed vireos are exceeded by three others. Ladybird beetles (Coccinellidae), with a percentage of only 1.36, seem not to be greatly in favor with the white-eyes. The wood-boring beetles make up 2.31 per cent, the scarabs 0.66 per cent, and all other beetles 1.46 per cent.

Hymenoptera and Diptera.—Of the annual subsistence of the white-eyed vireos 11.64 per cent is composed of wasps, bees, ichneumons, and flies. The hymenopterans appear in the food in moderate quantity each month, their greatest frequency being in May, at which time they have a relative value of 11.16 per cent. On the other hand, flies, though not found in stomachs collected after August, are taken freely earlier in the year. In June 20.43 per cent of the total food is made up of these insects, few of which are species of economic importance.

Orthoptera.—In discussing the food of the white-eyed vireos it seems best to separate the grasshoppers from the miscellaneous insects. The average percentage for the year is 5.36. In January

they make up 13.25 per cent and in February 11.88 per cent of the food. In March the percentage drops to 4.79, in April to 0.52, and in May and June none are eaten. A few are taken in July and August, and by October as much as 20 per cent of the food may be from this source.

Other insects.—Miscellaneous insects other than grasshoppers make up 3.74 per cent of the diet. The quantities eaten from month to month show no coordination, and the item appears to be greatly affected by chance. For instance, in January 5.68 per cent is to be referred here, in February none, in March 8.68 per cent.

Other animal food.—Spiders are at no time very abundant in the food, although in August they form as much as 7.76 per cent of it. The yearly average is 3.59 per cent. Other animal food is composed mainly of snails, and in one stomach were bones of a small chameleon, the two together making up only 0.37 per cent of the whole food.

VEGETABLE MATTER

In the spring and fall months foraging for suitable food compels the birds to turn to the berries and small fruits, which are usually to be had in almost any locality. In January 22.93 per cent of the entire food is vegetable, in February only 5.62, still less from March to July, in August 16.2, and in the next two months the percentage rises to 32.37. The vegetable food is composed of such berries as those of sumac, dogwood, wild grape, and wax myrtle, and has no economic importance.

SUMMARY

There is remarkably little in the food habits of the white-eyed vireos to condemn. The record of this species for the destruction of ladybird beetles is not bad and is more than offset by the destruction of many caterpillars, moths, plant bugs, and grasshoppers. These birds take very few beneficial hymenopterans and no valuable fruit.

THE HUTTON VIREOS

Vireo huttoni, subspp.

The Hutton vireos, in their subspecies, range over the greater part of the Pacific coast and eastward into southern Arizona and western Texas. Throughout their range birds of this species are locally somewhat common in thickets along streams. There are in the collection of the Biological Survey 77 stomachs available for study, 70 of which contained sufficient food for use in the tabulations. Unfortunately, these stomachs were not collected in consecutive months, none in March, April, May, or November, and only a few in each of the other months. The data available show a preponderance of animal food (98.23 per cent), with but 1.77 per cent of vegetable origin. It is probable that an investigation of more stomachs will materially alter the conclusions reached at this time. (See fig. 8.)

ANIMAL FOOD

The animal food is made up of insects and a few spiders, no trace of the few mollusks usual with other vireos being found. Caterpillars and other lepidopterous forms are not the dominating element of

the food, as in most of the other species, but are subordinate to the true bugs.

Hemiptera.—Nearly 46 per cent of all the food eaten by the Hutton vireos is composed of true bugs. A little less than half of this, or 20.15 per cent of the total, consists of stink-bugs (Pentatomidae). So far as the available data show, no stink-bugs are eaten in June or July. As the percentage for August is 33.6, however, it is probable that more stomachs would give a more even distribution for this item. The rest of the bugs do not figure very high until June, from which time on they are, in general, the largest element in the diet.

Lepidoptera.—Caterpillars, and moths and butterflies are about evenly balanced in the total subsistence of the Hutton vireos, the caterpillars amounting to 12.22 per cent and the adult forms to 12.33 per cent. July is apparently the month when this kind of food is most in demand.

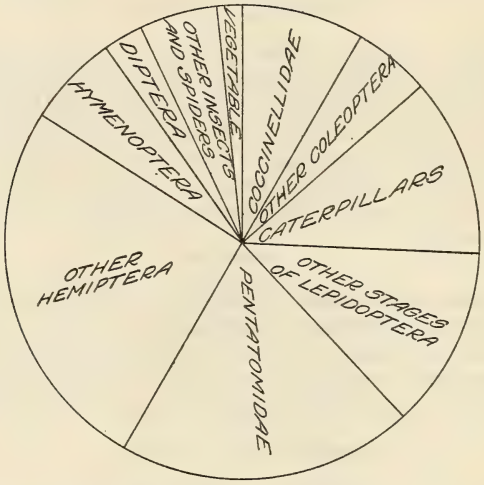

FIG. 8.—Yearly summary of the various items in the food of the Hutton vireos (*Vireo huttoni*, subspp.), based on the analysis of the contents of 70 stomachs

Coleoptera.—Of the 13.25 per cent representing beetles in the food of the Hutton vireos, about five-eighths are ladybird beetles (8.12 per cent). Ladybirds were found in nearly half the stomachs examined and appear to be a common food. Weevils (2.75 per cent) were fairly evenly distributed, but the rest of the beetles were found only infrequently.

Hymenoptera.—Hymenopterans were found regularly in the stomachs, and rather remarkably, the two months with the high averages are December and January. This unusual condition will in all probability be modified when additional material is examined. Otherwise, the monthly percentages appear to be normal, and the average for the year is 6.3 per cent.

Other insects.—Insects other than those belonging to the orders noted above occur so irregularly in the few stomachs examined that it is difficult to make any definite statement on their relative abundance in the food. During July, when miscellaneous insects should be taken in some quantity, none appear to be eaten, whereas in Febru-

ary, when according to our point of view few should be found, they amount to 14.1 per cent. The yearly average, from the data available, is 6.2 per cent.

Spiders.—Except for February, spiders were eaten in all months of the year that are represented by stomachs. The percentage is never high, December with 6.83 being the maximum and June next with 4.16 per cent. The average for the eight months is 2.05 per cent.

VEGETABLE FOOD

The record of vegetable food for the Hutton vireos is fragmentary, though coinciding so far as it goes with the known habits of other species of this family of birds. Except for months when no vegetable matter was found in the stomachs, the known data show a steady rise in the quantity eaten as the year approaches its end. The December percentage is 7.67 as compared with 0.7 in August. The yearly average is only 1.77 per cent.

SUMMARY

The evidence before us, though of questionable value because of the limited quantity of material, points to the fact that the Hutton vireos have a propensity for consuming undue numbers of ladybird beetles and rather fewer caterpillars than other vireos. Final judgment should be deferred, however, until additional material is available for analysis.

THE BELL VIREOS

Vireo belli, subspp.

The forms of the Bell vireos, like those of the Hutton, are birds primarily of the western United States, though their range extends much farther east than that of the Hutton vireos. In the willow thickets along water courses birds of this species may be found locally distributed in the greater part of the territory west of the Mississippi River. Although the available material in the collection of the Biological Survey suitable for examination consists of only 52 stomachs, these were collected in the months from May to August, inclusive, and serve as a fair index of the summer food. (See fig. 9.) Eleven additional, partially filled stomachs yielded other data concerning food items. Nothing can be said of the winter food at this time.

ANIMAL FOOD

Nearly all (99.3 per cent) of the food taken is of animal origin, such forms as bugs, beetles, caterpillars, and grasshoppers predominating.

Hemiptera.—Bugs make up 34.43 per cent of the summer food of the Bell vireos. Of these about a quarter (9.34 per cent of the total food) are referable to the family of stink-bugs (Pentatomidae). More stink-bugs are eaten early and late in summer than in July and August. On the other hand, the rest of the hemipterans show a steady decrease as the season advances. In May more than half the hemipterous food was made up of bugs other than stink-bugs; June shows a decrease to 28.07 per cent, July to 11.61 per cent, and in August only 4 per cent belongs in this category.

Orthoptera.—No other species of vireo of which the food habits are known takes so large a quantity of such bulky insects as grasshoppers, locusts, and the like. Though the present species is one of the smallest in size, it includes in its diet for July enough of the orthopteroids to make 34.88 per cent of that month's food. This form of food is essentially a summer type, none being taken in May, a considerable quantity in June, and 21.87 per cent in August. The average percentage for the summer months is 18.52.

Lepidoptera.—About one-fifth (20.63 per cent) of the subsistence of the Bell vireos during the summer is made up of caterpillars, and of adult moths and butterflies, and their eggs. As the last-named items are rarely found in a stomach, the figures given refer mainly to the first two. Caterpillars do not become an important factor in the economy of the birds before June, although a few (1.67 per cent) are eaten in May; in each of the months July and August the consumption amounts to about 25 per cent, and the average for the

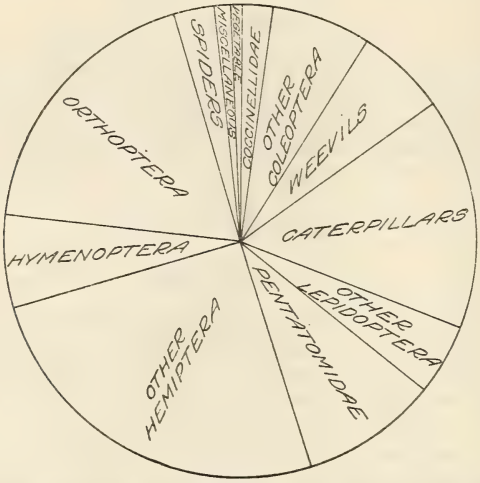

FIG. 9.—Yearly summary of the various items in the food of the Bell vireos (*Vireo belli*, subspp.), based on the analysis of the contents of 52 stomachs

four months is 15.89 per cent. Lepidopterans in other stages make up 4.74 per cent of the food, the consumption being heaviest in July (11.07 per cent).

Coleoptera.—Beetles of all kinds make up 15.26 per cent of the summer food of the Bell vireos. Ladybird beetles are taken in moderate numbers and form 2.19 per cent of the total food. Weevils (6.09 per cent) and leafbeetles (3.98 per cent) account for the most of remainder of the coleopterous food.

Hymenoptera.—Hymenopterans of all sorts (bees, wasps, etc.) amount to 6.44 per cent of the total diet during the summer months. The increase in consumption is at first slight, May and June being represented by 2.33 and 3.2 per cent, respectively. In July a sharp rise is noted to the maximum of 12.83 per cent; in August it is only 7.38. The evidence at hand probably gives a fairly correct view of the facts.

Other insects and spiders.—The rest of the animal food of the Bell vireos is composed of a few miscellaneous insects and spiders and a very few snails, spiders (2.71 per cent) being the most important. The first appearance of this group of food items was in the stomachs of birds taken in June, at which time it composed 6.93 per cent of the food. An immediate drop to 2.52 per cent took place the next month, and the percentage in August was nearly the same.

VEGETABLE FOOD

It is not until July that the Bell vireos feed on wild fruits. At that time 1.57 per cent of the subsistence is of vegetable matter. In August the percentage decreased slightly to 1.25. The average percentage for the year is only 0.7.

SUMMARY

During the summer months the Bell vireos consume a great many injurious insects and very few beneficial ones. Grasshoppers, locusts, caterpillars, and moths are frequently injurious to man's best interests, as also are many of the hemipterans. The percentage of these insects in the food of birds of this species is 73.58, nearly three-fourths of the total. Of the remainder about half the beetles and hymenopterans are injurious. This will add about 11 per cent, leaving about 16 per cent of the food of debatable import. As the small quantity of vegetable matter eaten is of no economic significance it may be disregarded. Ladybird beetles are about the only beneficial forms that the birds take, and these are not consumed in very great numbers.

GRAY VIREO

Vireo vicinior

The gray vireo is a rare bird in a restricted range, and for this reason is of very little economic importance. It may be seen in southern California, southern Nevada, Arizona, New Mexico, as far east as western Texas, and south to northern Mexico and on the peninsula of Lower California.

There are only two stomachs in the collection of the Biological Survey, and, while from such limited material it is impossible to draw more than an inference, it may be said that the habits indicated are similar to those of the Hutton and Bell vireos. Caterpillars and a small moth were found in one stomach, together with a stink-bug (*Prionosoma podopioides*), a tree hopper (*Platycentrus acuticornis*), and a tree cricket (*Oecanthus*). In the other stomach two dobson flies (*Chauliodes*), a small cicada (*Tibicinoides hesperius*), and a long-horned grasshopper made up the greater part of the contents; two beetles (*Acmaeodera neglecta* and *Pachybrachys*) complete the list.

Because of the relative infrequency of its occurrence and the chiefly beneficial nature of its food habits as here indicated, it is probable that the gray vireo will never prove destructive.

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found* [1]

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS Gastropoda (snails)								
Unidentified	2		1	2	5	6		2
Zonitidae:								
Zonitoides arboreus					1	1		
Helicidae:								
Pyramidula alternata					1			
Helicodiscus lineatus			1					
Polygyra jejuna					1			
Vallonia sp			1					
Pupidae:								
Pupa armifera						1		2
Pupa sp			1					
CLASS Arachnida (spiders, etc.)								
Order PSEUDOSCORPIONIDA (pseudoscorpions)								
Cheliferidae:								
Chelifer sp			1					
Obisiidae:								
Chthonius sp				1				
Order PHALANGIDA (harvestmen)								
Unidentified	10	1			8	6		
Order ARANEIDA (spiders)								
Unidentified	129	23	66	29	50	45	20	15
Argiopidae (orb weavers):								
Unidentified	6							1
Tetragnatha elongata	2		1			3		
Tetragnatha straminea	1							
Tetragnatha sp	2			2	1	2		
Araneinae, unidentified	11			1	1	5		
Scoloderus tuberculiferus						1		
Aranea sp	1		2		1		1	
Micrathena gracilis						1		
Thomisidae (crab spiders):								
Unidentified			1		1			
Misumena sp							1	1
Xysticus sp						1		
Clubionidae:								
Clubiona sp	1		1					
Lycosidae (wolf spiders):								
Unidentified	2		1		1			
Sosippus sp	1							
Lycosa sp						1		
Attidae (jumping spiders):								
Unidentified	32	7	17	6	14	20	3	3
Synemosyna formica			1			2		
Phidippus sp	1		2	4		2		
Thiodina puerpera						1		
Dendryphantes capitatus		1						
Dendryphantes sp		2	1					
Wala palmarum	2							
Pellenes sp			1					
Lyssomanes viridis	1							
Order ACARINA (mites)								
Parasitidae (unidentified)	1							
CLASS Insecta (insects)								
Unidentified adults	2		2	1	2			
Unidentified eggs	4	1				2		1

[1] The number of stomachs recorded here often exceeds the number used in tabulating food percentages as recorded in the text, because a portion of the stomachs examined did not contain sufficient food for the estimation of percentages but did yield data concerning food items. The food items of the black-whiskered vireo (4 stomachs) (see pp. 3–4) and of the gray vireo (2 stomachs) (see p. 27) have not been included in the tabulation.

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS Insecta (insects)—Contd.								
Order ODONATA								
Unidentified	11		1	1	7	1	1	1
Zygoptera (damsel flies) unidentified	1				2	6		
Argia bipunctata	1							
Argia sp.					1			
Anisoptera (dragon flies) unidentified				4		3		
Order EPHEMERIDA (May-flies)								
Unidentified	2			1			1	
Unidentified eggs				1				
Order PLECOPTERA (stone flies)								
Unidentified					1			
Order ISOPTERA (white ants)								
Unidentified				1				
Order ORTHOPTERA (grasshoppers, etc.)								
Phasmidae (walking sticks):								
Unidentified adults	1							1
Unidentified eggs	1							1
Diapheromera femorata	2					1		
Diapheromera femorata (eggs)				1				
Acrididae (short-horned grasshoppers):								1
Unidentified	26		9	2	14	9		16
Tryxalinae, unidentified					2	10	1	4
Acridiinae, unidentified							1	
Melanoplus sp.	2		1	2				
Tettigidae (unidentified grouse locusts)			1			1		
Locustidae (long-horned grasshoppers):								
Unidentified adults	14		9			5		7
Unidentified eggs	6		4		1	1		
Neoconocephalus sp.					1			
Gryllidae (crickets):								
Unidentified	1		1			1		
Oecanthus sp.	1		6	1		4		8
Nemobius sp.					1			
Order PALAEOPTERA (roaches)								
Blattidae (unidentified eggs)	1							
Order DICTYOPTERA (mantids)								
Mantidae					1			
Order CORRODENTIA (book lice)								
Psocidae					2			
Order NEUROPTERA (stone flies)								
Perlidae	2	1	1	2		2		
Order HEMIPTERA (true bugs)								
Unidentified adults	129	11	74	18	16	39	22	22
Unidentified eggs						2		
Scutelleridae (shield bugs):								
Dfolcus chrysorrhoeus						1		
Eurygaster alternatus					2			
Cydnidae (negro bugs):								
Corimelaena sp.			1					

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS Insecta (insects)—Contd.								
Pentatomidae (stink-bugs):								
Unidentified	63	2	17	26	45	36	7	12
Unidentified eggs				2				1
Brochymena affinis							2	
Brochymena arborea					1	1		
Brochymena cariosa					1			
Brochymena quadripustulata	1			1	2			
Brochymena sp	7			18	34	4	2	
Peribalus sp								1
Mormidea lugens			1					
Euschistus tristigmus			1	1	3			
Euschistus sp	5	4	4	11	13	16	2	3
Cosmopepla sp	1						1	
Thyanta custator	1		3			1	9	
Thyanta sp			2			10	3	
Nezara hilaris	24		1		1	2	2	
Nezara sp	1				2			
Banasa sp	1			4	7			
Dendrocoris contaminatus			1					
Meadorus lateralis	1		2		1			
Perillus bioculatus	2							
Podisus maculiventris	4			2	1	1		
Podisus placidus		1			1			
Podisus sp	58	1	18	9	44	12	9	3
Coreidae (squash bugs):								
Unidentified			1	1		1	4	
Leptoglossus sp	1							
Anasa armigera	2							
Alydus pilosulus	1							
Alydus sp					5		1	
Corizus sp						1		
Leptocoris trivittatus			2					
Lygaeidae (chinch bugs, etc.):								
Unidentified			5	2	1	2		
Lygaeus bicrucis					2			
Belonochilus numenius					2			1
Ischnorrhynchus sp	1	5	7		4	4	1	
Oedancala dorsalis				1				
Ligyrocoris sp	1					1		
Phymatidae:								
Phymata fasciata	1							
Phymata sp			2	3	2			
Reduviidae (assassin bugs):								
Unidentified	6			3	2	7	1	5
Unidentified eggs					7			
Zelus exsanguis	1							
Zelus sp	2		1					
Acholla sp			1					
Sinea diadema	4							1
Sinea sp	17		5	4	3	6	2	2
Nabidae (damsel bugs):								
Nabis sp	1							
Capsidae (plant bugs):								
Unidentified			3			1	1	
Lygus pratensis			1					
Cicadidae (cicadas):								
Unidentified						1		
Tibicen sp	1			1				
Cicada sp	3				1			
Platypedia putnami					2			
Cercopidae (spittle insects):								
Unidentified	1	1	2					
Aphrophora parallela			1					
Aphrophora quadrinotata	1							
Aphrophora sp					1			
Membracidae (tree hoppers):								
Unidentified	27	4	44	14	41	40	12	12
Ceresa sp	3			2				1
Stictocephala sp			1					
Acutalis calva			2					
Telamona sp							1	
Telamonanthe rileyi							1	
Cyrtolobus sp	2	1	9	1	9	1		
Vanduzea arcuata		1						
Entylia sinuata	1							
Platycotis minax					1			
Platycotis sp	1			3				
Tylocentrus reticulatus								2

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS Insecta (insects)—Contd.								
Cicadellidae (leaf hoppers):								
Unidentified					4			
Idiocerus sp.		1	1					
Aulacizes irrorata				3	3	10		
Aulacizes sp.					1			
Graphocephala coccinea					1	1		
Gypona sp.		1	1		2	1	1	
Xerophloea sp.								1
Jassinae	6	2	31		2	12	8	5
Athysanus sp.						1		
Phlepsius sp.					1			
Thamnotettix sp.			1					
Delphacidae (unidentified)					1			
Psyllidae (unidentified jumping plant lice)			1				5	
Aphididae (unidentified plant lice)						1		
Coccidae (scale insects):								
Unidentified	51	6	18	9	10	44		2
Lecanium caryae				1	1			
Lecanium pruinosum					1			
Lecanium corni				1				
Eulecanium sp.	5							1
Neolecanium sp.						2		
Kermes kingii				1				
Pulvinaria vitis				1				
Toumeyella liriodendri				1				
Saissetia oleae							9	
Order LEPIDOPTERA (butterflies, moths, etc.)								
Unidentified adults	35	4	28	53	57	39	19	5
Unidentified pupae	16	2	19	4	3	4		
Unidentified caterpillars	371	42	222	78	145	128	31	28
Unidentified eggs	4	1	7	3	16	24	3	7
Papilionidae (swallow-tailed butterflies):								
Papilio troilus (caterpillar)	1							
Nymphalidae (brush-footed butterflies):								
Chorippe celtis (caterpillar)	1							
Hesperiidae (skippers):								
Unidentified adults	1							
Unidentified caterpillars						1		
Sphingidae (hawk moths):								
Unidentified caterpillars	1							
Ceratocampidae:								
Anisota sp. (caterpillars)				1				
Arctiidae (tiger moths):								
Unidentified caterpillars		1						
Noctuidae (cut worms):								
Unidentified caterpillars	3							
Apatela sp. (caterpillars)	1							
Acronycta afflicta (caterpillars)	1							
Neuronia sp. (caterpillars)	1							
Notodontidae:								
Unidentified caterpillars	1	1						
Notodonta unicornis (caterpillars)	1							
Heterocampa sp. (caterpillars)	4					1		
Fentonia marthesia (caterpillars)	1							
Lasiocampidae (tent caterpillars):								
Malacosoma sp. (eggs)	5							
Geometridae (loopers):								
Unidentified caterpillars	1							
Tineidae:								
Unidentified moth								1
Unidentified pupa						1		
Unidentified case bearers			1					

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS Insecta (insects)—Contd.								
Order COLEOPTERA (Beetles)								
Suborder COLEOPTERA Genuina								
Unidentified	49	1	12	7	6	9	14	4
Carabidae (ground beetles):								
Unidentified	3		1				1	
Pterostichus sp	1							
Platynus sp	1							
Lebia ornata			1					
Lebia viridis	3							
Lebia sp			1		1			
Callida viridipennis	1							
Harpalus sp					1			
Hydrophilidae (water beetles):								
Hydrochus sp						1		
Philhydrus sp		1						
Staphylinidae (rove beetles):								
Unidentified	1						1	
Philonthus sp							1	
Paederini			1					
Cryptobium sp		1						
Tachinus sp								1
Phalacridae:								
Unidentified					1			
Phalacrus politus	1							
Coccinellidae (ladybirds):								
Unidentified	7	2	19	2	4	3	4	3
Anisosticta strigata	1							
Megilla fuscilabris	3	2	3			1		
Hippodamia ambigua			1				2	
Hippodamia convergens			7		2		3	1
Hippodamia parenthesis	1		1	1				
Hippodamia tredecimpunctata	2	1	4					
Hippodamia sp			1		3			
Cycloneda munda	2		4	1	3	6		
Coccinella abdominalis			2					1
Coccinella californica			41		24		26	1
Coccinella franciscana	1							
Coccinella novemnotata	3	1	3			1		
Coccinella transversoguttata	1		2					
Coccinella trifasciata	6	4	2	1	1			
Coccinella trifasciata juliana			8		1		2	
Coccinella sp		1						
Adalia annectans	1							
Adalia bipunctata	25	5	4		6	7	1	
Adalia frigida	2	2	6		1			1
Adalia sp				1				
Anisocalvia quattuordecimguttata		4						
Harmonia duodecimmaculata					3			
Harmonia picta	2		4				1	
Neomysia pullata	3		1		2			
Anatis quindecimpunctata	21	1	6	7	39	1		
Anatis quindecimpunctata mali	1		1		1			
Psyllobora vigintimaculata		2	4		1	1		
Chilocorus bivulnerus	1					4		
Axion tripustulatum	3		1		2	3		
Brachyacantha ursina	1	1						
Brachyacantha sp						1		2
Hyperaspis signata			4		1			
Hyperaspis signata binotata	1					1		
Hyperaspis sp		1						
Scymnus collaris	1	2						
Scymnus haemorrhous			1			1		
Scymnus sp							1	
Colydiidae:								
Lasconotus complex							1	
Histeridae (shining carrion beetles):								
Unidentified	1						1	
Unidentified (larva)			1					
Hister perplexus	1							
Temnochilidae:								
Tenebrioides sp. (larva)					1			

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS **Insecta** (insects)—Contd.								
Elateridae (click beetles):								
Unidentified	68	6	19	11	32	16		6
Deltometopus amoenicornis						1		
Elater linteus						1		
Elater nigricollis	2				2			
Elater sp	1				1			
Drasterius sp	1				1			
Agriotes ferrugineipennis	2							
Agriotes oblongicollis	6	1						
Agriotes stabilis				1				
Agriotes sp				1				
Melanotus americanus	1							
Melanotus communis	2							
Melanotus sp	1					1		
Limonius basilaris	2			1		3		
Limonius crotchii	1							
Limonius griseus					1			
Limonius quercinus	1							
Limonius sp	3	3	1	5	2	6		
Athous brightwelli	1							
Corymbites aethiops	1							
Corymbites hamatus					1			
Corymbites hieroglyphicus	5			1	2			
Corymbites propola					1			
Corymbites resplendens					4			
Corymbites spinosus	1							
Corymbites tarsalis	2			1				
Corymbites triundulatus					1			
Corymbites sp	1							
Hemicrepidius decoloratus						1		
Buprestidae (metallic wood borers):								
Unidentified			1	4	4		1	1
Dicerca sp	2							
Trachykele lecontei						1		
Cinyra gracilipes	1							
Melanophila drummondi	1							
Melanophila sp					1			
Anthaxia quercata	2							
Anthaxia sp		1						2
Chrysobothris chryseola					3			
Chrysobothris femorata	2		1	1				
Chrysobothris sp			1	4	2	1		
Acmaeodera tubulus	1							
Agrilus egenus						1		
Agrilus politus	1							
Agrilus ruficollis						1		
Agrilus sp	21		15	1	5	4	1	7
Brachys aerosa	1							
Brachys sp	1							
Telephoridae (fireflies):								
Chauliognathus marginatus						1		
Chauliognathus sp	1							
Telephorus scitulus		1						
Telephorus sp						1		
Malachiidae:								
Malachius spinipennis			1					
Attalus sp			2					
Cleridae (checkered beetles):								
Cymatodera ovipennis							2	
Derestenus furcatus						1		
Enoclerus ichneumoneus (larva)				1				
Enoclerus lunatus						1		
Placopterus thoracicus	2							
Hydnocera discoidea								1
Hydnocera pallipennis	3							
Hydnocera unifasciata	1							
Hydnocera verticalis	1					1		
Phyllobaenus dislocatus	1							
Orthopleura texana			1					
Ptinidae:								
Eupactus nitidus				1				
Eupactus punctualatus						1		
Eupactus viticola						3		
Catorama sp								1
Caenocara sp						1		
Ptilinus ruficornis					1			

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS Insecta (insects)—Contd.								
Bostrychidae:								
Polycaon plicatus						1		
Amphicerus bicaudatus				1	1			
Lucanidae (stag beetles):								
Platycerus quercus	1		2	4		1		
Scarabaeidae (dung beetles and leaf chafers):								
Unidentified	21	3	7	7	15	3	1	
Ataenius cognatus	1							
Aphodius femoralis		2		1		1		
Aphodius fimetarius	1	1	2	1	5			
Aphodius granarius	1		1	1	1	1		
Aphodius inquinatus		2			4	2		
Aphodius lividus		1						
Aphodius wolcotti		1						
Aphodius sp		1		1	1			
Hoplia trifasciata	4		2	2				
Hoplia sp	1	1		8	2	3		
Dichelonyx bachii			1		6			
Dichelonyx crotchii			3					
Dichelonyx elongata	10	1		1				
Dichelonyx fuscula	1							
Dichelonyx subvittata		2						
Dichelonyx sp	25	1	6		3			
Serica sericea		1						
Serica sp	1							
Phyllophaga sp							1	
Anomala binotata	2		1					
Anomala lucicola	2					1		
Anomala oblivia					1			
Anomala sp	8					1		
Gnorimus maculosus	1							
Trichius sp					1			
Valgus squamiger					1			
Cerambycidae (long-horned wood borers):								
Unidentified	22	3	8	19	28	6	6	2
Phymatodes amoenus	1							
Physocnemum brevilineum	1			1		1		
Elaphidion villosum	1			2				
Elaphidion sp								1
Molorchus bimaculatus					1	1		
Molorchus sp			1		1			
Xylotrechus colonus						1		
Xylotrechus sp	1			1				
Neoclytus erythrocephalus						1		
Neoclytus sp	1							
Clytanthus ruricola	1							
Clytus marginicollis						1		
Clytus sp			2		2			
Cyrtophorus verrucosus	1							
Euderces pini	1					2		
Euderces sp					2			
Centrodera picta	1				1			
Acmaeops directa					2			
Gaurotes cyanipennis	1							
Anthophilax viridis					1			
Anthophilax sp					1			
Typocerus sp					1			
Leptura militaris			1				1	
Leptura nitens	2							
Leptura scripta	1							
Leptura sphaericollis	1							
Leptura vagans	1							
Leptura vittata	1		1					
Leptura sp			1		1			
Ipochus fasciatus							1	
Psenocerus supernotatus			1		1	3		
Leptostylus aculiferus	1				1	1		
Leptostylus sp			1	1	1			
Liopus adspersus	1							
Liopus alpha						1		
Liopus fascicularis						1		
Liopus sp	1		1	3	1	2		
Lepturges querci					1			
Lepturges signatus					1			

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS Insecta (insects)—Contd.								
Cerambycidae—Continued.								
Hyperplatys maculata	4		1	3		1		1
Hyperplatys sp		1	1	1	1	1		
Pogonocherus crinitus							1	
Ecyrus dasycerus	1							
Spalacopsis filum			1					
Saperda lateralis	1							
Saperda tridentata	2							
Saperda sp	2							
Mecas inornata	1							
Chrysomelidae (leaf beetles):								
Unidentified adults	30	5	25	4	8	24	5	5
Unidentified larvae								1
Donacia aequalis						1		
Donacia sp	1				1			
Orsodacna atra	3	3	6			1	1	
Zeugophora scutellaris			1					
Syneta carinata			1					
Syneta ferruginea	22	10	2	2	7	1		
Syneta sp			1		2			
Saxinis omogera	2							
Chlamys plicata					1	1		
Bassareus sellatus						1		
Cryptocephalus castaneus								1
Cryptocephalus guttulus	1			1		1		
Cryptocephalus mutabilis	1					3		
Cryptocephalus quadriguttatus			1					
Cryptocephalus quadrinotatus	1							
Cryptocephalus sp	1			1		3		
Pachybrachys abdominalis	1		1					1
Pachybrachys atomarius		1	2					
Pachybrachys viduatus			1					
Pachybrachys sp	3		3	1	4	5		2
Myochrous denticollis	1					1		
Glyptoscelis barbata				1				
Glyptoscelis pubescens	2			2	2	3		
Glyptoscelis sp	3				1	2		
Typophorus canellus	10	6	2	2		11		1
Tymnes picipes	2					1		
Tymnes tricolor						1		
Tymnes sp	1		1			3		
Xanthonia decemnotata	8	8	5	6	4	1		
Fidia sp		1						
Colaspis brunnea	1				1	3		
Colaspis favosa						1		
Colaspis sp	1							
Nodonota puncticollis	4							
Nodonota tristis	4	1				3		
Nodonota sp			1					
Chrysodina globosa	1		1			3		
Gastroidea dissimilis			1					
Gastroidea sp			6		3			
Lina interrupta		1						
Lina lapponica	1		2					
Lina scripta	1		5	1				
Lina sp			1		1			
Ceratoma trifurcata	1							
Galerucella sp			2					
Monoxia consputa							3	
Diabrotica duodecimpunctata	8	1	1			3	1	1
Diabrotica vittata	6	1						
Diabrotica sp	1							
Halticini		1	1			2		
Oedionychis limbalis			1					
Oedionychis sexmaculatus						5		
Oedionychis suturalis						3		
Oedionychis sp						1		
Disonycha pennsylvanica			1					
Disonycha triangularis	1							
Disonycha sp								1
Phyllotreta picta	1							
Haltica chalybea	2	1				11		
Haltica ignita	1		1			4		1
Haltica sp	6	2				4		
Chaetocnema sp		1						

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS INSECTA (insects)—Contd.								
Chrysomelidae—Continued.								
Crepidodera helxines	6	7	10		2	9		1
Epitrix parvula								1
Systena bitaeniata		1						
Systena marginata			2					
Systena sp						1		1
Dibolia borealis	1							
Chalepus dorsalis	3							
Chalepus nervosa			1					
Chalepus rubra	3					1		
Stenispa metallica	1							
Coptocycla bicolor			1					
Coptocycla sp								1
Bruchidae (bean weevils):								
Spermophagus robiniae	1							
Bruchus cruentatus					1			
Bruchus prosopis	1							2
Tenebrionidae (darkling beetles):								
Unidentified					1	2	1	
Haplandrus ater					1			
Blapstinus metallicus					1			
Blapstinus sp			2					
Hypophloeus sp	1							
Helops aereus				2				
Helops micans	2			1	2	1		
Helops sp					1		1	
Strongylium crenatum				2				
Cistelidae:								
Hymenorus sp						1		
Cistela brevis	1							
Isomira sericea	3					2		
Isomira texana						8		
Isomira sp	2					4		
Melandryidae:								
Unidentified	2			5	2	3		1
Synchroa punctata	1			2				
Marolia fulminans							1	
Eustrophus sp	1							
Mycterus scaber	1		1					
Oedemeridae (unidentified)			2			1		
Cephaloidae:								
Cephaloon lepturides	1							
Mordellidae:								
Unidentified								1
Mordella octopunctata	1							
Mordella sp	2							
Anthicidae (flower beetles):								
Unidentified			2					
Eurygenius sp				1				
Stereopalpus sp	1		1					
Macratria confusa						1		
Notoxus monodon						1		
Notoxus sp							1	
Pyrochroidae:								
Dendroides sp						1		
Meloidae (blister beetles):								
Pomphopoea aenea				5				
Pomphopoea sp						2		
Rhipiphoridae:								
Rhipiphorus pectinatus			1					
Suborder RHYNCHOPHORA (weevils)								
Unidentified	75	10	27	25	23	35	12	11
Anthribidae (fungus weevils):								
Ischnocerus sp	1							
Anthribus cornutus						1		
Brachytarsus sp				1				
Araeocerus fasciculatus						3		
Curculionidae (curculios):								
Unidentified	17							1
Rhinomacer sp	1				1			
Auletes sp						1		
Eugnamptus collaris	2		11			1		
Eugnamptus sp	1		2					
Rhynchites bicolor						1		

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS Insecta (insects)—Contd.								
Curculionidae—Continued.								
Attelabus analis			1			2		
Attelabus bisustulatus						1		
Attelabus nigripes						2		
Apion cribricolle			1					
Apion sp						1	1	1
Ithycerus noveboracensis	1							
Phyxelis rigidus	1							
Otiorhynchini	1	2	4	2	8	2	4	2
Coleocerus sp						1		
Geoderces sp	1							
Pachnaeus distans						1		
Tanymecus confertus	2		2					
Pandeleteius hilaris	2	1		2				
Brachystylus acutus				1				
Pantomorus sp			1					
Aphrastus taeniatus	2					3		
Polydrusus sp	1							
Scythropus elegans			1		7		1	
Eudiagogus pulcher						1		
Sitona hispidula	1	2	1	5		2		
Sitona sp				1	3	6	1	
Hypera punctata	1							
Phytonomus nigrirostris	1	5		1				
Phytonomus sp			2	2			1	
Hyperodes solutus						1		
Erirhinini								1
Dorytomus sp	1	1	2	2				
Desmoris constrictus								1
Otidocephalus myrmex						1		
Magdalis armicollis	2							
Magdalis sp					1			
Balaninus caryatrypes	1							
Balaninus occidentis							1	
Balaninus sp	21		3	10	6		4	
Elleschus sp			1					
Anthonomus grandis						2		
Anthonomus signatus						1		
Anthonomus sp		1	2			1		2
Prionomerus calceatus	2					2		
Barini			1					
Madarellus undulatus						2		
Centrinus picumnus						1		
Gelus oculatus	1							
Cylindrocopturus koebeli							1	
Cylindrocopturus quercus	1							
Ceutorhynchini						2		
Coelogaster zimmermanni						1		
Cryptorhynchini						1		
Conotrachelus albicinctus	2							
Conotrachelus anaglypticus				3	2	4		
Conotrachelus coronatus						1		
Conotrachelus elegans	1							
Conotrachelus nenuphar	4			3	8			
Conotrachelus sp				2	3	2		
Cryptorhynchus sp						1		
Cossonini				1				
Rhyncholus oregonensis	1							
Scolytidae (bark beetles):								
Unidentified			3			1	3	2
Platypus flavicornis						1		
Scolytus quadrispinosus	2							
Hypothenemus sp		1						
Pityophthorus sp		1						
Ips pini	1				2	1		
Ips plastographus							1	
Ips sp						1		
Dendroctonus valens				1	2			
Order MEGALOPTERA (Dobson flies)								
Sialidae:								
Unidentified		1	3	3	3	1		
Chauliodes pectinicornis	2			3	2			
Chauliodes sp						1		
Sialis sp		1						

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS Insecta (insects)—Contd.								
Order RHAPHIDIOIDEA								
Rhaphidiidae:								
Rhaphidia arizonica			2					
Rhaphidia sp	6		8				2	
Order NEUROPTERA (net-winged insects)								
Unidentified adults	2		1			1		
Unidentified eggs	1							
Chrysopidae:								
Chrysopa sp	4		1			1	1	
Myrmeleonidae (ant lions):								
Myrmeleon sp					3			
Order DIPTERA (flies)								
Unidentified adults	79	9	103	39	42	33	11	5
Unidentified pupae	2		1		1	1		
Unidentified eggs			1					
Tipulidae (crane flies):								
Unidentified adults	29	1	6		8	1		2
Unidentified eggs	3		3					
Tipula sp						1		
Psychoididae unidentified moth flies)					1			
Chironomidae (unidentified midges)	6	19	2	2	1	6		
Bibionidae (March flies):								
Unidentified			1			1		
Bibio sp	1				1	2		
Simuliidae (black flies):								
Simulium sp		1						
Leptidae (snipe flies):								
Leptis sp			1					
Stratiomyiidae (soldier flies):								
Odontomyia sp	1							
Tabanidae (horse-flies):								
Tabanus sp				2				
Asilidae (robber flies):								
Unidentified	3					1		
Asilus sp					1			
Dolichopodidae (unidentified)								1
Syrphidae (flower flies):								
Unidentified	5	2	2		5	2		
Myiolepta nigra		1						
Syrphus sp							1	
Temnostoma excentricum					1			
Ortalidae:								
Pyrgota valida				1				
Chloropidae (unidentified)			3		1	1		
Scatophagidae (dung flies):								
Scatophaga sp		1						
Muscidae (house flies)	11	2	3		2	2		
Pollenia rudis					1			
Tachinidae (unidentified parasitic flies)	3							
Order HYMENOPTERA (wasps, bees, etc.)								
Unidentified adults	181	28	74	30	52	65	22	17
Unidentified pupae					1	2		
Xyelidae:								
Macroxyela sp					3			
Pamphiliidae:								
Unidentified			1					
Pamphilus sp					1			
Tenthredinidae (sawflies):								
Unidentified adults	3	1	8	1	3	1		
Unidentified larvae		2	3					
Dolerinae	1		1	1				
Dolerus unicolor			1	1	2	1		
Dolerus sp		2	6	3	2			
Macrophya sp		1						
Nematinae		2						
Nematus erichsoni		1						
Pteronidea sp		1						
Pteronidea ventralis		1						
Arge clavicornis	1							

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	365	160	329	229	77	63
CLASS Insecta (insects)—Contd.								
Xiphydriidae:								
Xiphidria sp	2				1			
Siricidae:								
Sirex sp					1			
Tremex columba	1				1			
Oryssidae (unidentified)					2			
Vipionidae:								
Apanteles sp		1						
Braconidae:								
Unidentified						1		
Earinus limitaris			2	1	2	1		
Urosigalphus sp			1				1	
Heterospilus sp						1		
Trigonalidae:								
Trigonalys sulcata	1							
Ichneumonidae (ichneumon flies):								
Unidentified	4			3	5	5	2	
Aphidius sp		1						
Campoplex sp		1						
Mesochorus sp						1		
Paniscus geminatus	2							
Paranomalon sp	1	1						
Enicospilus purgatus	2							
Ophion bilineatus	3	1			1			
Ophion sp	4	1			1	1		
Catoglyptinae		1						
Tryphoninae					1	1		
Diplazon sp						1		
Exochinae					1			
Chorineus sp					1			
Lissonotinae				1				
Glypta rufiscutellaris					1			
Glypta tuberculifrons				1				
Glypta sp					3			
Conoblasta sp	1							
Ichneumoninae					1			
Scambus sp	1							
Pimplidea pedalis				1				
Itoplectis conquisitor			1	1	1			
Ichneumon irritator	1			1	9			
Calliephialtes sp						1		
Mesosteninae						1		
Phygadeuon sp	1							
Plesignathus sp	1							
Hemiteles areator tenellus						1		
Hemiteles sp	1							
Amblyteles sp					1			
Pterocormus sp	1					1		
Melanichneumon sp	1							
Cratichneumon coerulens	1							
Cratichneumon sp	2							
Cynipidae (gall wasps):								
Unidentified adults				1	2	2		
Unidentified cocoons			1			2		
Callirhytis maxima					1			
Callirhytis sp					1			
Andricus sp					2			
Figitidae:								
Figitodes sp								1
Callimomidae:								
Callimome sp			1					
Chalcididae:								
Unidentified	3		2	1				
Chalcis ovata			1					
Chalcis robusta						1		
Formicidae (ants):								
Unidentified	70	4	34	21	40	25	6	7
Aphaenogaster fulva	1							
Aphaenogaster sp		2						
Myrmica punctiventris	1							
Myrmica rubra	1							
Myrmica sp		1						
Camponotus pennsylvanicus	11	4	1	1	6	1		1
Camponotus whymperi					1			
Camponotus sp	9	1	2	1	1	1	1	1
Colobopsis sp						2		

TABLE 2.—*List of items of animal food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
CLASS Insecta (insects)—Contd.								
Formicidae—Continued.								
Lasius americanus	1							
Lasius sp.	1							
Formica pallidefulva		1						
Formica sanguinea						1		
Formica subsericea	1	2					1	
Formica sp.	4	1			1			
Chrysididae (gold wasps):								
Unidentified						1	1	
Omalus sinuosus			1					
Bethylidae:								
Isobrachium sp.	1							
Scoliidae (digger wasps):								
Tiphia inornata	2							
Tiphia sp.	4	1	1			1		
Eumenidae (potter wasps):								
Odynerus sp.	1							
Ancistrocerus tigris					1			
Vespidae (hornets and yellow jackets):								
Unidentified			1					
Vespula vulgaris				1				
Vespula sp.							1	
Dolichovespula diabolica	1							
Sphecidae (solitary wasps):								
Hoplisus sp.					1			
Solenius sexmaculatus	1							
Solenius sp.	1							
Crabro sp.	1							
Aphilanthops frigidus	1							
Larropsis distincta			1					
Xylocelia sp.	2							
Halictidae (green bees):								
Halictus lerouxi	2							
Halictus sp.	1		1	1		3		
Augochlora sp.							1	
Oxystoglossa pura	2							
Oxystoglossa sp.	1							
Evylaeus arcuatus						1		
Evylaeus pectoralis	1							
Chloralictus coeruleus	1		1					
Chloralictus pilosus	1		1					
Chloralictus zephyrus			1		1	1		
Chloralictus sp.				1		4		1
Andrenidae (burrowing bees):								
Andrena bisalicis	1					1		
Andrena claytoniae						1		
Andrena cressoni			1			1		
Andrena flavoclypeata	1		1			1		
Andrena mariae concolor					1			
Andrena nasoni						2		
Andrena robertsoni					1			
Andrena salictaria			2			2		
Andrena vicina				1	1			
Andrena sp.	2		2	4	2	2		
Parandrena wellesleyana					1			
Trachandrena crataegi					2			
Trachandrena forbesi				1				
Trachandrena rugosa					2			
Trachandrena sp.					2			
Nomadidae (parasitic-bees):								
Nomada sp.					2	3		
Colletidae:								
Colletes sp.					1			
Apidae (honeybees):								
Apis mellifera	2							1
CLASS Reptilia (reptiles)								
Iguanidae (iguanas):								
Anolis carolinensis						1		

TABLE 3.—*List of items of vegetable food identified in stomachs of vireos and the number of stomachs in which found* [1]

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
Unidentified vegetable matter			5					
Anthers of unidentified flower	1							
Unidentified bud scales		2	4	2		2		
Unidentified woody galls	6		7		2		2	
Unidentified fruit skins	36	2	3	1	2	6		1
Unidentified seeds and seed pods	4					5	2	1
Pinaceae:								
Juniperus sp					1			
Gramineae:								
Digitaria ischaemum (small crab grass)	1							
Digitaria sanguinale (large crab grass)								2
Setaria glauca (yellow foxtail)	1							
Zea mays (maize)	1							
Liliaceae:								
Smilax sp. (greenbrier)					1			
Myricaceae:								
Myrica carolinensis (bayberry)	5	1	1		6	24		
Urticaceae:								
Morus alba (white mulberry)	3							
Morus rubra (red mulberry)						1		
Polygonaceae:								
Polygonum convolvulus (black bindweed)								1
Polygonum sp. (smartweed)						1		
Chenopodiaceae:								
Chenopodium sp. (lamb's quarters)				1				
Amaranthaceae:								
Amaranthus sp. (pigweed)	1							1
Phytolaccaceae:								
Phytolacca decandra (pokeweed)	1		3	1		1		
Magnoliaceae:								
Magnolia foetida (evergreen magnolia)	2							
Lauraceae:								
Sassafras variifolium (sassafras)	6			1				
Benzoin aestivale (spicebush)	7							
Saxifragaceae:								
Ribes sp. (currant)	1					1		
Rosaceae:								
Pyrus arbutifolia (chokeberry)	1							
Amelanchier sp. (shadbush)	1							
Rubus sp. (blackberry)	11					7		
Rosa sp. (rose)	1	2						
Prunus pennsylvanica (fire cherry)	1							
Prunus serotina (black cherry)	1							
Prunus virginiana (choke-cherry)	1							
Prunus sp. (cherry)			1					
Rutaceae:								
Xanthoxylum americanum (prickly ash)	1							
Anacardiaceae:								
Rhus diversiloba (western sumac)			1					
Rhus glabra (smooth sumac)						1		
Rhus toxicodendron (poison ivy)						9		1
Rhus typhina (staghorn sumac)	2							
Rhus sp. (sumac)			1		4	8	6	
Aquifoliaceae:								
Ilex vomitoria (youpon)						1		
Celastraceae:								
Celastrus scandens (bittersweet)	1							
Rhamnaceae:								
Berchemia scandens (supplejack)					1			

[1] See footnote to Table 2, p. 28.

TABLE 3.—*List of items of vegetable food identified in stomachs of vireos and the number of stomachs in which found*—Continued

Kind of food	Red-eyed	Philadelphia	Warbling	Yellow-throated	Blue-headed	White-eyed	Hutton	Bell
Total number of stomachs examined	653	84	356	160	329	229	77	63
Vitaceae:								
Unidentified		1						
Vitis cordifolia (frost grape)	1							
Vitis sp. (grape)	2		3	2	1			
Psedera quinquefolia (Virginia creeper)	12					2		
Eleagnaceae:								
Shepherdia sp. (buffalo berry)	1							
Cornaceae:								
Cornus alternifolia (alternate-leaved dogwood)	9							
Cornus amomum (kinnikinnik)	1							
Cornus asperifolia (rough-leaved dogwood)	1							
Cornus canadensis (bunchberry)	1							
Cornus florida (flowering dogwood)	1		1		1	1		
Cornus paniculata (panicled dogwood)	15	3	3					
Cornus sp. (dogwood)	5	1	12		1			
Ericaceae:								
Vaccinium sp. (blueberry)	1							
Verbenaceae:								
Callicarpa sp. (Mexican mulberry)	1							
Solanaceae:								
Solanum dulcamara (deadly nightshade)	1							
Solanum sp. (nightshade)						1		
Caprifoliaceae:								
Lonicera hirsuta (hairy honeysuckle)	1							
Viburnum dentatum (black haw)						1		
Viburnum sp. (black haw)	3				1			
Sambucus canadensis (elder)	11		1			3		1
Sambucus sp. (elder)			8		1	1	1	

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